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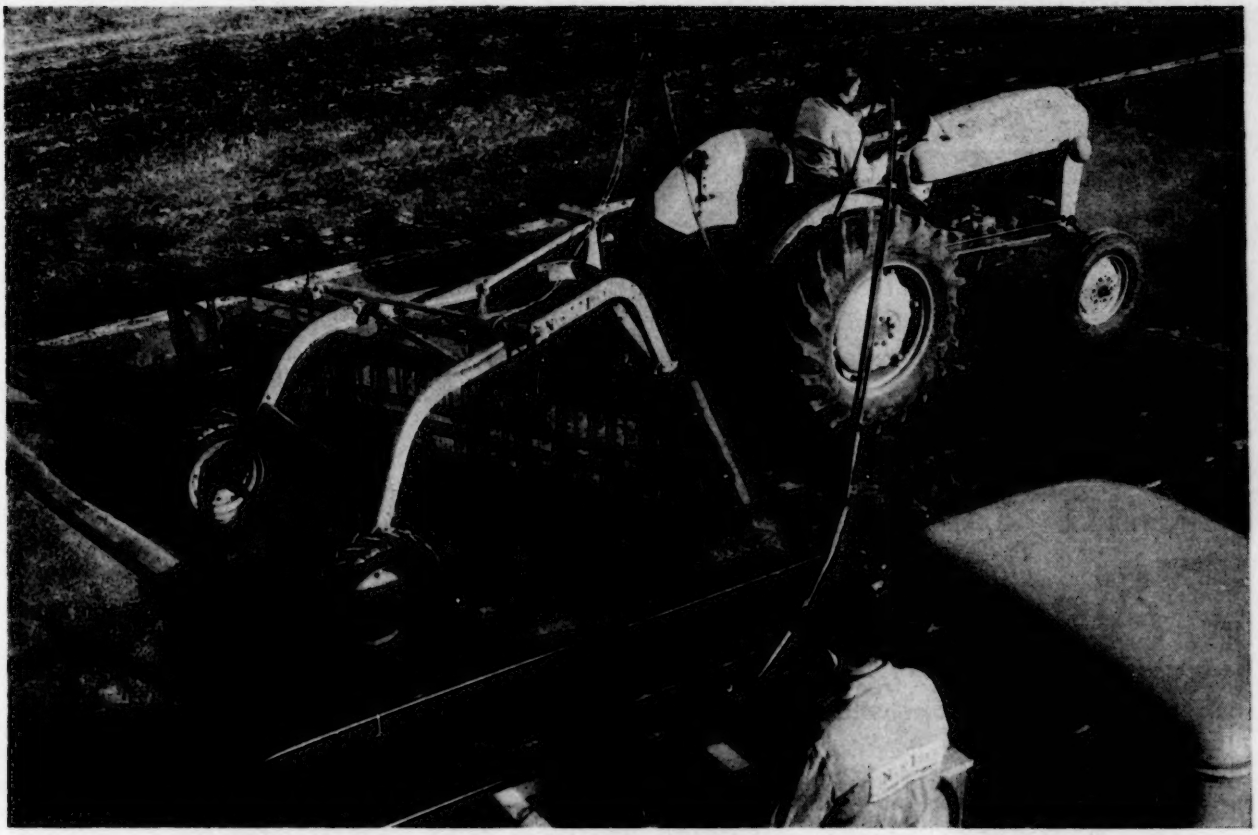

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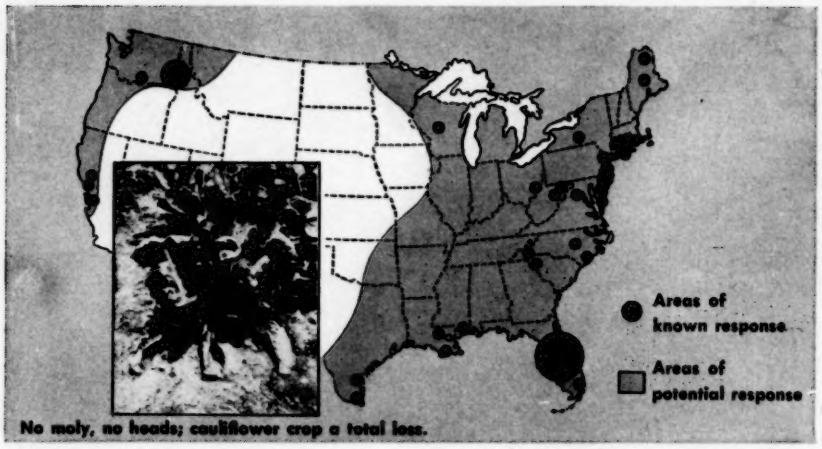

No moly, no heads; cauliflower crop a total loss.

Can You Spot Crops Starved for Moly?

Recognizing moly-deficiency symptoms early enough to recommend moly applications can turn withering crops into healthy stands

At a technical meeting several years ago, someone asked a speaker where responses to molybdenum applications are most likely to be found. The speaker quickly answered, "On soils near an experiment station with a staff member who's familiar with moly-deficiency symptoms and who's testing for molybdenum responses."

This remark wasn't made entirely to provoke a laugh, notwithstanding the need for a little humor at technical confabs.

What the speaker was underscoring was that we didn't then have any idea how extensive the need for moly in the United States might be. There were relatively few agricultural people who knew much about moly, especially its effects in the field. Those few who did —naturally concentrated at places such as experiment stations—found soils that needed moly because they knew what they were looking for.

Dotting the Map

Now some years later, we have expanded our knowledge of moly's role in practical farming considerably. The once few pioneers working on moly at experiment stations are now many. They and other soil scientists at universities and research institutions, as well as farmers themselves, have dotted the map (see illustration) with locations of soils requiring moly for full productivity. At least thirty crops have been shown to respond to moly applications. Of these, ten are now being grown commercially in the United States with the aid of moly.

But, although we have come a long way with moly in just a few years, many growers are still getting marginal yields, or even losing crops, because they don't recognize the symptoms of moly starvation. They can see that something is wrong, but they don't know what. They either haven't heard, or can't believe, that as little as a few ounces to a pound of moly per acre can mean the difference between skimpy, curled, twisted and scorched plants of little value and healthy crops of prime quality.

Key to Growth

Moly, while required in amounts considered minute even for a trace element, performs two essential functions in plants. It is needed for the fixation of atmospheric nitrogen by the bacteria in the root nodules of legume crops. It also is required in all crops, non-legumes as well as legumes, in the reduction of nitrates to nitrogen—the first step in protein synthesis.

Plants lacking sufficient moly show characteristic symptoms related to moly's key role in plant growth. Legumes have the well-known signs of nitrogen starvation. They are stunted, pale yellowish in color, low in protein content and hard to establish; fields are patchy. Non-legumes exhibit yellowish coloration in the leaves—chiefly in spots where nitrate accumulates between the veins and around the rim—and often the leaves are curled or cupped upwards, or otherwise distorted. Growth is poor and irregular, and the crop has an overall pale yellowish cast.

Some of these symptoms had been recognized as specific diseases—e.g., "whiptail" of cauliflower and "yellow spot" of citrus—for years before moly deficiency was discovered as the cause.

Following are more detailed descriptions of easily detected symptoms in common crops:

Beets. Plants may be stunted. Leaves narrow. Yellowing leaves make red veins stand out.

Cauliflower, broccoli. Whiptail. (See illustration.) Heads do not develop, or develop unevenly.

Cabbage. Yellowish mottling throughout leaf area between the veins. Heading prevented by twisting and cupping.

Peas. Leaves turn yellow and become somewhat transluscent. Dwarfing occurs. Vines weak and short.

Beans. Yellowish mottling sometimes called "scald". Flower and seed yield often greatly reduced.

Tomatoes. Curling and cupping of leaves. Formation of flowers and fruit reduced.

Celery. Tops turn pale green, then yellow.

Cantaloupe, cucumbers. Leaves are light green to yellow, develop edges which wither and curl. Stunting.

Differences in Soils

Crop response to moly application is often observed on soils of low pH, since under acid conditions moly is often tied up in a form unavailable to the plant. Liming, in making the soil more alkaline, releases moly to plants, and on some soils, this release of acid-bound moly may be the chief function of lime. In such cases, a few ounces of moly may be more effective and economical than several tons of lime.

Soils likely to be extremely low in moly are those that have been highly leached, such as coastal sands and hill country soils, soils that have been heavily cropped, and soils in areas of heavy rainfall. Conversely, highly productive, fertile soils, heavily limed or manured soils, and soils in regions of low rainfall are unlikely to produce visible deficiency symptoms, but increased yield and better quality may result from moly application.

In the United States, most reported responses to corrective treatment with moly are in the areas east of the Great Plains, and along the Gulf of Mexico, and in the Pacific Northwest. But until more testing is done, it is unwise to say categorically that crops grown in other areas won't respond to moly.

No Trick to Testing

Deficiency symptoms and soil types are good guides to the possible need for moly but they aren't infallible diagnostic aids. Systematic testing should always precede general application to the field.

It's easy to do:

The first step is to make up a stock solution by dissolving one ounce of sodium molybdate in one gallon of water.

With vegetable crops such as cauliflower, broccoli and beets, select and mark one or more rows in the center of the field. Diluting three cups of stock solution to one gallon of water, apply the moly to the test rows, at the rate of one quart per 250 feet of row. Compare treated and untreated rows every other day.

With legumes such as alfalfa and clover, lay out a test plot 10 yards square adjacent to an untreated area to be used as a control. Follow your usual fertilizer program, but use no nitrogen on either control or test plot. Spray the test plot with one cup of stock moly solution diluted to one gallon. Applications can be made at seeding time or to an established stand. Make regular observations, comparing thickness of stand, color and quality of growth.

For a one-ounce test sample, and further information on how to lay out test plots, address Dept. 50, *Climax Molybdenum Company, 500 Fifth Avenue, New York 36, N. Y.*

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Reconnaissance Methods of Measuring Erosion

CLARK H. GLEASON

It isn't always easy to tell just how much erosion occurs even when the same area is kept under observation. Reference points of some kind are necessary. The author describes some methods of establishing satisfactory reference points where none are naturally available. Once such points are established, checks on amount of erosion can be more accurate.

THE MEASUREMENT of soil loss on eroding slopes requires reference points, and under natural conditions such points are often indistinct or lacking. This paper, based on studies in California brushland burns, describes four kinds of reference points that can be established easily to help measure erosion at the place where it occurs The methods employ gully transects, spikes with loose-fitting washers, bottlecaps, and the use of paint in pressurized cans.

Gully Transects

The gully transect method is similar to the one commonly used on cultivated land by the Soil Conservation Service (1) in which the volume of soil lost is calculated from the depth, width, and length of gullies. This method goes farther, however, in using permanent stakes so that the transect can be re-established for future observation and measurement.

Rills and shoestring gullies are measured along a transect. It is convenient to set transect stakes 50 feet apart, on contour, using a cloth tape. The depth, width, and a correction factor for the cross-sectional area of each rill and gully are tallied, along with its distance from the tape's zero end. The depth and width are measured with a pocket rule.

The correction factor, which allows for the slope of the gully walls, is estimated at the time of measurement. On the soils studied, the factor has averaged about 70 percent. This means that the true cross sectional area of the gully is 70 percent of the rectangular area calculated from the depth and width.

Areas of sheet erosion or deposition can also be referenced to the tape, the depth of soil loss or gain being measured from indicators such as erosion pedestals or buried char-marks in a burn (2).

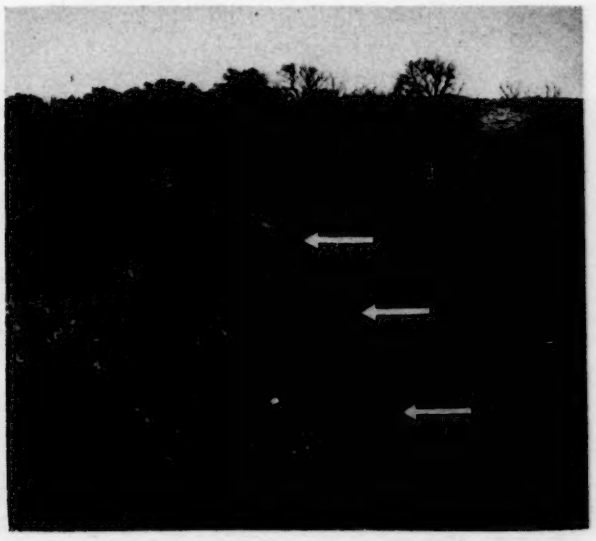
To determine soil loss per unit area, say in cubic feet per acre, the cross-sectional areas are multiplied by aver-

Clark H. Gleason is forester, California Forest and Range Experiment Station, Forest Service, U. S. Department of Agriculture. This station is maintained at Berkeley, California in cooperation with the University of California.

This article is based on a paper presented at the General Geology Session, American Association for the Advancement of Science, Berkeley, California, December 30, 1954.

Fifty-foot transect on a burned over hillside. White cloth "flags" at 10-foot intervals show the locations of spikes and washers used to record amount of erosion. U. S. Forest Service photo.

Three gully transects 50 feet apart on the slope, at points shown by arrows, helped measure amounts of erosion for two years after a chaparral fire. U. S. Forest Service photo.



age gully length. If the results are to be expressed in cubic yards per square mile, the average gully length should be corrected to its horizontal projection after the erosion volume is calculated.

In subsequent examinations, previously measured gullies can be identified and changes in their size can be noted. In burned areas gullies are often erased in the summer months by the action of wind, gravity, and animals. Re-examination of the transect permits recognition of changes.

Three gully transects measured for two years after the Green River fire of 1948, in Orange County, produced striking results. The transects were located 50 feet apart on a 50- to 60-percent slope. The first winter, under light rainfall and heavy winds, the measurements showed soil loss of 11,000 cubic yards per square mile. The second winter brought more rainfall, and soil loss occurred at the rate of 38,000 cubic yards. Both values are in line with erosion rates measured in other burns by debris basins and reservoirs.

Spikes and Washers

Galvanized spikes and washers have been used along with gully transects. The spikes were 12 inches long, the washers loose-fitting. At regular intervals along the transect, a spike with washer was driven carefully until the washer rested on the soil surface and the spike head just touched the washer. Purpose of the washers was to record gullies that might be cut and then filled before the next examination.

In the Sconyers Ranch burn of 1949, Colusa County, the washers dropped ⅛ inch below the spike heads although the spikes when re-examined were entirely buried in soil. This showed that erosion of ⅛ inch had occurred, followed by deposition of soil washed or blown down from above. Thus, the washers recorded what had happened since the last examination, much as a maximum-minimum thermometer records temperature.

Bottlecaps

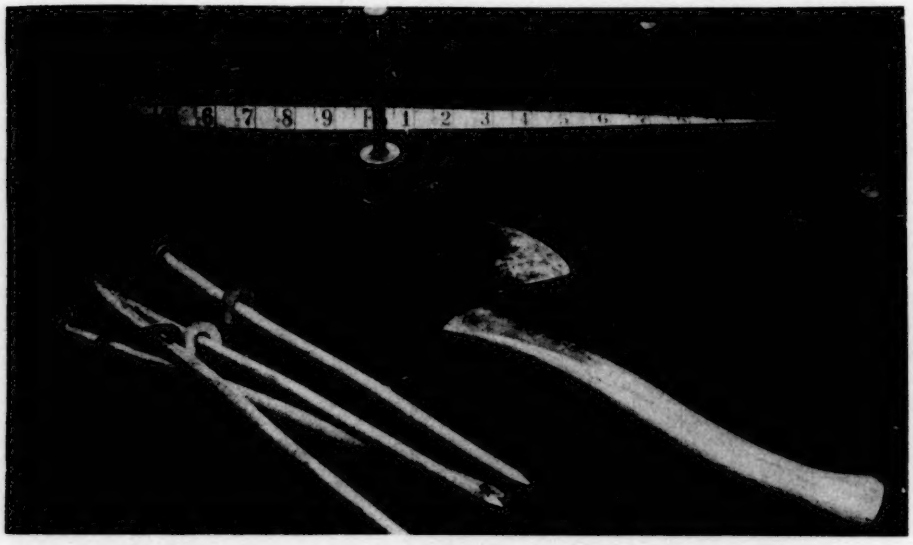
Bottlecaps placed cup-side down on the soil have been used to detect sheet erosion. The caps produce erosion pedestals like those formed naturally under stones, leaves, and twigs. The height of the pedestal indicates the depth of soil lost. To show whether or not a bottlecap has moved since it was placed, a flat washer is put on the ground inside the cap. Caps that have moved from their washers are rejected.

By placing several groups of bottlecaps in burned areas, we have detected differences in the erosion of different soils under the same conditions of rainfall. In February 1952 bottlecaps were installed in the Navajo-Black burn of 1951, San Luis Obispo County, and in the Wheeler Springs burn of 1948, Santa Barbara County.

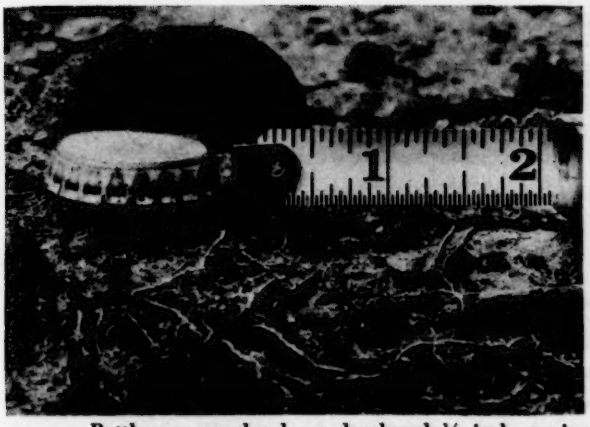
Six weeks and several storms later they were re-examined. The coarse, sandy soil material on the year-old burn was only one to two inches deep on decomposed granite bedrock; this soil showed no pedestalling although severe gully erosion occurred on steeper slopes nearby. The deep, clay-loam soil on the four-year old burn showed pedestalling of 1/16 to ¼ inch—evidence of erosion in the last six weeks. This soil loss was confirmed by newly exposed rootlets on the same site.

Thus, the bottlecaps demonstrated important differences in the character of these two soils. The year-old burned area showed no sheet erosion, perhaps because of the shallowness and coarse, granular texture of the soil. The four-year old burn on clay loam eroded at rates equivalent to 5,000 to 21,000 cubic yards per square mile.

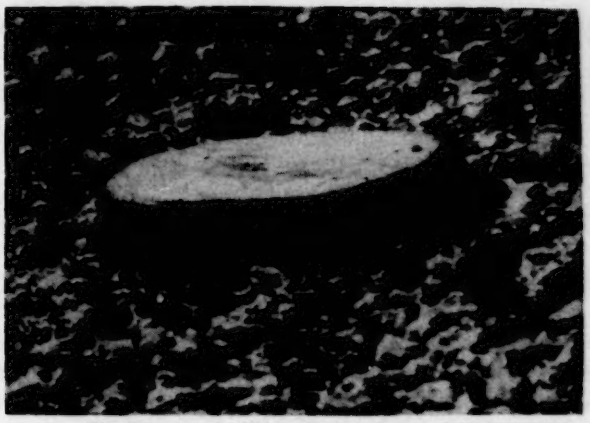
In the Elk Mountain control burn of 1952, Lake County, bottlecaps were placed across a contact between a sandy loam (Maymen soil series) and a clay loam (Los



Spikes and washers (one spike partly driven) are used to record erosion along transect marked by tape. Washer falls as soil is washed away. The location of washer shows erosion even if covered later by soil washed in from above.



Bottle cap on clay loam developed ¼ inch erosion pedestal in six weeks. Exposed rootlets confirm soil loss. Forest Service photo.



Bottle cap on decomposed granite soil showed no signs of erosion during same period of exposure to winter rains. Forest Service photo.

Gatos series). At the end of the first winter the caps on sandy loam had formed pedestals averaging 0.04 inch high, equivalent to erosion of approximately 3,500 cubic yards per square mile. The caps on clay loam showed pedestals averaging 0.38 inch high, equivalent to soil loss of more than 32,000 cubic yards. Neither rills nor gullies were formed on these soils, and the evidence of erosion might have been overlooked if the bottlecaps had not been used.

Paint Collars

Paint sprayed as a collar around rootcrowns and rocks at the soil level has been used as a reference point for measuring soil movement. The spraying was done with pressurized cans of enamel, using care to avoid coating the soil surface. White paint was found to be more visible and more durable than yellow or aluminum.

In one burn two years after painting five groups of rootcrowns and stones, bare surfaces below the paint collars indicated erosion of ¼ to 1½ inches, averaging ¾ inch. The measurements were made when the soil was thoroughly wet, so that expansion—if any—should have already occurred. Deposition was also measured by the collar method.

Recommendations

Caution must be used in appraising the results obtained by these methods, just as with other methods of measuring erosion on the slopes where it occurs. Adequate sampling is required, and the measurements must be taken from a representative area.

Measurements obtained to date by the methods described have not been compared with the total catch of erosion debris from the sites sampled. Moreover, statistical controls for the placement of reference points, such as the number of bottlecaps to be used and the most desirable distribution patterns for them, have not been worked out.

Nevertheless, the new methods can help land users gather information as a basis for comparing the effects of different land treatments, and the door is open for technicians to refine the methods for the benefit of students and practical land managers alike.

In the meantime, the methods described offer means of learning more about erosion, and of measuring the amount of erosion or deposition that occurs in a given spot in a given length of time. By drawing attention repeatedly to designated reference points on the ground surface, they can help land managers recognize erosion caused by land treatment. The methods are direct and simple; they can be used by the average person as well as by technicians. They are easy for one man to apply and they require a minimum of equipment.

LITERATURE CITED

1. Bamesberger, John G. *Erosion losses from a 3-day California storm.* Soil Conservatioin Service, U. S. Dept. of Agr. 24 p. illus. 1939.
2. Gleason, Clark H. *Indicators of erosion on watershed land in California.* Amer. Geophys. Union Trans. 34(3):419-26. 1953.

Paint collars on rocks and shrubs make reference points from which to measure changes in soil level. U. S. Forest Service photo.

Dust Bowl: Causes and Effects

W. S. CHEPIL

In the 1930's and again in the 1950's portions of the Great Plains, especially the southern Plains, have been termed the "Dust Bowl." The Great Plains extend in a broad belt nearly from the Mississippi River to the Rocky Mountains and from the Gulf of Mexico into the prairie provinces of Canada. The Columbia River Plains are also subject to considerable wind erosion. Recently this area has been termed "Little Dust Bowl." Other regions affected by substantial wind erosion are the Colorado Basin and some parts of the Pacific Southwest, the muck and sandy soils around the Great Lakes, and the sands of the Gulf and Atlantic seaboards. By far the greatest damage from wind erosion has been in the Great Plains. This paper will refer primarily to this region.

W. S. Chepil

MUCH can be learned about causes of dust storms from lessons of the past. Wind erosion has been a common occurrence on the Plains since white man first came into this area and probably even before.

There is abundant evidence that dust storms occurred before cultivation of the soil began. The following extracts from official weather records at Dodge City, Kansas, indicate the presence of dust storms in that region more than 60 years ago:

April 8, 1890: At 10 a.m. the dust in the air was so dense that objects could not be distinguished 100 yards off. No one who could possibly remain indoors was on the street."

August 13, 1892: The wind raised such a cloud of dust that it was impossible to see over 150 feet ahead."

April 6, 1893: The dust was blinding and was deposited so thickly on office furniture that everything looked as though it were covered by a layer of dirt prepared for a hotbed."

May 15, 1894: The dust caused by high wind was terrible."

These storms occurred at the time when virtually no land in the southwest had been broken from virgin sod (6). Some of the dust was ashes of burnt grass, but there is some indication that much of it was surface soil.

There is considerable evidence too that wind erosion became even more serious after the virgin lands were broken and planted to cultivated crops. One notable example of accelerated wind erosion occurred in Colby District, Kansas, during the years 1910 to 1914. About 65,000 acres were affected by severe blowing in that area (4). Surface soil down to plow depth was removed from some fields. This occurred on hardland soils which today are considered to be more resistant to wind erosion than sandy soils. The sandy soils south and west of that region had not been broken at that time.

Wind Erosion Every Year

Some wind erosion has taken place in sections of the Plains almost every year since settlement was completed. The period of most extensive and severe erosion occurred in the 1930's. At one time or another during that period the entire Plains region was affected. Many fields lost as much as 12 inches of top soil. Some sandy land was converted to sand dunes. Many farmers abandoned their farms and left the Plains.

A more tranquil weather and above-normal rainfall ensued in 1940 and continued till the end of the decade. Some dust storms occurred in the 1940's but they were local and mild compared with the earlier ones. Many settlers came to the Plains and occupied farms abandoned in the 1930's or settled and broke new land on the drier and sandier fringes of the old "dust bowl."

About four million acres of the remaining grassland were plowed up in the southern Great Plains between 1942 and 1952 (3). A considerably smaller acreage of

W. S. Chepil is soil scientist, Western Section of Soil and Water Management, Agricultural Research Service, U. S. Department of Agriculture. He is in charge of the Wind Erosion Laboratory at Manhattan, Kansas.

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grassland was broken in the northern Great Plains. Most of this sod land was not suited for permanent cultivation for it is situated either in areas normally too dry for cultivation or too sandy to resist strong winds.

Severe and extensive drought and dust storms returned to the Plains in the early 1950's and continued into 1956. The extent of the area subject to accelerated wind erosion was greater in 1956 than it has ever been in the history of the Plains. The Soil Conservation Service estimates that about 14 million acres not suited for permanent cultivation are now being cultivated on the Great Plains (7). Nearly all of this land is subject to severe wind erosion. They advise that it should be converted to permanent grassland as soon as possible.

Causes of Dust Storms

The basic causes of wind erosion are few and simple. Wherever (1) the soil is loose, finely divided, and dry, (2) the soil surface is smooth and bare, and (3) the wind is strong, erosion may be expected.

By the same token, wherever (a) the soil is compacted, kept moist, or made up of stable aggregates or clods large enough to resist the force of wind, (b) the soil surface is roughened or covered by vegetation or vegetative residue, or (c) the wind near the ground is somehow reduced, erosion may be curtailed or eliminated. These general conditions form the basis for effective wind-erosion control.

Denudation—the Major Cause

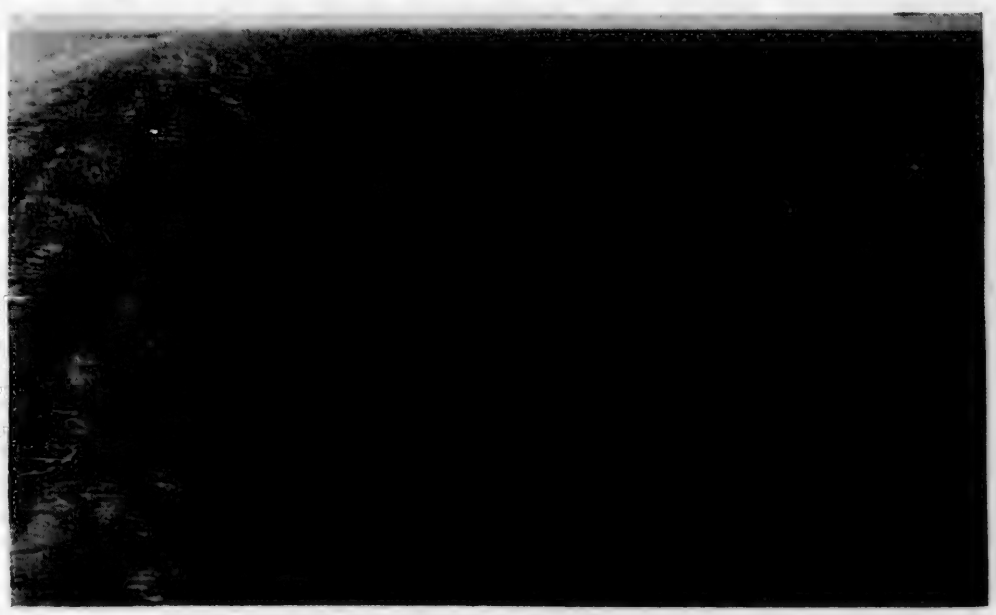
Of the major causes of accelerated wind erosion on the Plains, the most important has been the depletion or destruction of vegetation or vegetative residue on the land. Drought at times has reduced or stopped the vegetative growth, but drought alone has not been the cause of severe wind erosion. Some erosion occurred when the land was covered with natural vegetation but the amounts were small compared with those occurring after man began to deplete and destroy the vegetative cover. In the earliest days of white man's settlement of the Plains, destruction of vegetative cover by prairie fires was the main cause of severe erosion of soil by wind.

A quotation from the *Kansas Free State,* Lawrence, Kansas, January 31, 1855, is given to illustrate this point: *"The strong south winds that we experience here are our greatest annoyance. They frequently last for several days, and are loaded with a black dust from the burnt prairie which penetrates every corner of our houses and makes everyone who is exposed to it as sooty as a collier. This annoyance, however, will not be so great when the surrounding country is brought under cultivation and the prairies cease to be burned."*

Evidently some of the early settlers failed to perceive that destruction or removal of vegetative cover from the surface of the land—by fire or any other means—is the basic cause of dust storms.

Later, depletion of grass by overgrazing supplemented and superseded the burning as the major cause of dust storms. Many areas of the range were overstocked by 1885. Having only the grazing rights and no title to the land, the cattlemen were strongly tempted to graze all the grass possible. Dust storms became a serious consequence in the 1890's.

Plowing of grasslands without knowledge of or regard to the ultimate consequences became the major cause of subsequent dust storms. Homesteaders gained title to the land replacing the cattlemen. They plowed up the sod and planted grain. Between 1910 and 1920, for example, 10 million acres of grassland were put under the plow in North Dakota alone. The cycle of wet years and World War I accelerated the break-up of the sod. Farm tractors



Sorghum stubble in this photo was flattened by an unusually strong wind on February 19, 1954, near Tribune, Kansas. Such a wind is likely to occur only once in 15 to 20 years. Note the soil erosion.

gave further impetus to so-called "dry farming" on the Plains.

In this early period of agricultural history there seemed to be absolutely no recognition of the importance of vegetation and vegetative residue for protection of the soil against wind and water erosion. The plow and the disk and drag harrows developed in and adapted to more humid regions were the principal tillage implements. Vegetative residues were buried and the soil surface was left smooth, loose and fine. This set the stage for serious dust storms in the 1930's.

A survey of the portions of the Southern Great Plains during that period showed that cultivated and idle land suffered more than three times as much wind erosion as pasture land (5). Pastures on the whole were eroded and in poor condition, but not nearly so much as idle and cultivated land.

Climatic Factors

Extended periods of drought and high wind-velocity have contributed to the severity of wind erosion. Great variations in precipitation and wind velocity exist on the Plains. These variations are governed by the normal probability law. The general frequency of occurrence of periods of high wind and low precipitation can be predicted from past records for any given location, but unfortunately the time when these periods will occur cannot.

It is essential therefore to establish soil conservation practices that will be effective against wind erosion wherever it may occur. Emergency measures adopted after wind erosion has started never have been entirely effective in preventing damage to crops and soil.

Due to great climatic extremes, occasionally some wind erosion will occur even under the best land management. The amount of vegetation or well-anchored crop residue required for adequate protection against a wind velocity which will occur on the average of once every 10 years is far more than can be grown even in wet years.

Wind Flattens Stubble

The occurrence of unusually high wind on February 19, 1954, in eastern Colorado, western Kansas, and the panhandle areas of Oklahoma and Texas is a good example. This wind was strong enough to blow standing wheat stubble out of the ground and to blow out or flatten much of the untilled sorghum stubble. The wind piled up loose soil in ditches and other depressions and in fields where some crop residue still remained. These loose drifts were moved even by gentle winds. The effects of that one high wind on soil erodibility no doubt were carried well into 1955.

Such a wind is likely to occur, on the average, only once in about 20 years. When it occurs and the soil is dry, some erosion is bound to take place regardless of how well a vegetative cover is managed.

The amount of erosion on February 19, 1954, and subsequent days was far less on fields that had some vegetative cover than on those that had little or none. Vegetative cover was paramount in importance in reducing and in some cases eliminating erosion (2). Soil cloddiness was of secondary importance. On the whole the sandy soils had neither the vegetative cover nor the degree of cloddiness necessary to resist the wind and were therefore much more affected than the hardlands.

Damage to Soil

In their native condition, most of the Plains soils were characteristically loose and finely granulated at the surface. Alternate wetting and drying and freezing and thawing tended to break soil clods into finer aggregates. Effects of weather were greatest at the soil surface but diminished rapidly with depth and virtually ceased at a depth of about three to four inches.

Under natural conditions, grass usually protected the fine surface material from erosion by wind. As soon as the grass was destroyed or the sod broken and the soil surface was left bare, the fine surface soil was blown readily by the wind.

A recent study showed that some newly broken hardland (loessal) soils of the Plains were more than twice as erodible by wind as the land broken about 20 years previously (1). The binding action of native grass roots apparently was insignificant or lasted only for a short period after breaking.

Less Productive Subsoil

The highly erodible surface soil is now gone from many of these old cultivated fields, exposing a more clayey and more wind-resistant, though less productive, subsoil.

In this study about 9 inches of surface soil was gone from the old cultivated fields. Little of this soil was trapped in nearby grasslands. Most of it was carried out of the area in the form of dust.

Climatic factors remaining the same, the rate of soil removal from the old cultivated land is expected to be considerably lower in the future than it has been in the past. This conclusion is based on the fact that the surface soil of the old cultivated land is now more clayey, more cloddy, and therefore more wind-resistant than it was soon after breaking.

The above condititon is a typical example of non-selective removal of soil by wind. This type of removal is associated with loessal soils believed to be deposited from the atmosphere throughout past geologic eras. The composition of these soils is predominantly very fine sand, silt and clay—all removable by wind in the same manner they were brought in. The abrasive action of saltation is sufficient to break down soil aggregates to dust which can be transported great distances by wind.

Great deposits of loess exist on the Plains. These represent a great land resource—ironically a product of wind

erosion that has occurred elsewhere. Apparently there was a long period of build-up of these grassland soils due to trapping of dust that was blown in from some distant areas. These deposits show the great importance of wind as a geologic mover of dust.

There is another type of removal that is far more injurious, though somewhat less extensive, on the Plains. It is known as selective removal. It occurs on soils developed from glacial till, residual material, mountain outwash, and sandy soils of any origin.

On these soils, the wind acts like a fanning mill on grain. It removes only the fine and light materials. This sorting action over a period of years has made these soils progressively coarser in texture at the surface. Some of these soils have become covered with sand dunes. This process is apparently proceeding in exactly the same way in some relatively small areas in the United States as it did in some parts of the Old World—parts that were once fertile plains but have since been changed to sandy wastes.

The damage to soils subjected to selective removal by wind has been far more serious than is reflected in crop yields. Considerable increases in sandiness have made these soils even more erodible than they were originally. Such changes generally are beyond human repair.

The Problem of Sandy Soils

Greatest wind erosion problems are usually on sandy soils. These have lost from 10 to 75 percent of their original content of silt, clay, and organic matter in the surface layer since they were broken from virgin sod. If exploitation of these lands for production of erosion-susceptible crops continues and if the rate of change in texture is the same in the future as it was in the past, a great proportion of these soils will change to sand dunes in a relatively short period of time. The rate of change actually is expected to accelerate because the sandier a soil the more erodible it becomes.

The cheapest method of solving the problem might be to take the worst of these lands out of cultivation and seed them permanently to grass. Other more productive sandy lands must remain covered with cultivated vegetation or vegetative residue at all times.

Re-vegetation of sandy areas, however, will take care of only a small part of the whole wind-erosion problem. New and better techniques must be adopted if serious erosion of our soils by wind is to be prevented.

Summary

To summarize, dust storms are almost certain to occur within periods of prolonged drought and extreme wind velocity. But they do not have to be as severe as they have been in the recent past.

With new techniques of maintaining soil cloddiness, vegetative cover, surface barriers and roughness, erosion can be controlled as when the soil was protected by native grasses. Today some soils are more erodible than they were when first brought out of sod and some are less erodible. Some lands must be put back to grass or they will be abandoned and remain a threat to better lands around them.

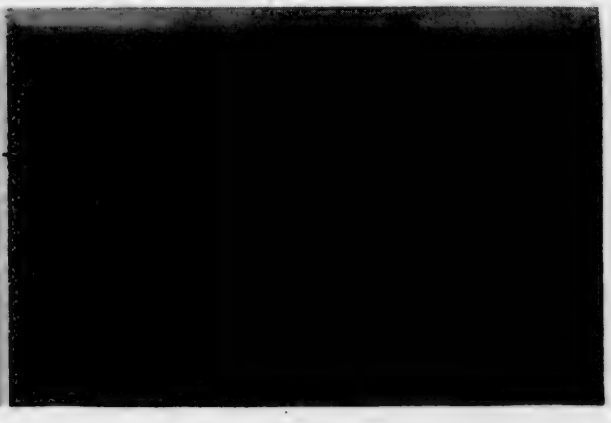
The greatest need today is not the knowledge of how to conserve the soil (although more knowledge is required) but the determination and willingness to leave the land in as good or better condition than it was found.

LITERATURE CITED

1. Chepil, W. S., Englehorn, C. L., and Zingg, A. W. *Effect of cultivation on erodibility of soils by wind.* Soil Sci. Proc. 16:19-21, 1952.
2. Chepil, W. S. and Woodruff, N. P. *How to reduce dust storms.* Kansas Agricultural Experiment Station Circ. 318, 1955.
3. Finnell, H. H. *Dust storms of 1954.* Sci. Amer. 191:25-29, 1954.
4. Jardine, W. M. *Management of soils to prevent blowing.* Jour. Amer. Soc. of Agron. 5:213-217, 1913.
5. Joel, A. H. *Soil conservation reconnaissance survey of the Southern Great Plains wind erosion area.* U. S. D. A. Tech. Bull. 556, 1937.
6. Malin, James C. *Dust storms, 1900-1950.* Kansas Historical Quarterly 14:1-71, 1946.
7. U. S. Department of Agriculture, Soil Conservation Service. *Facts about wind erosion and dust storms on the Great Plains.* Leaflet No. 394, 1955.

Poor stand of wheat (foreground) failed to protect soil from wind erosion. Crop residue cover (upper left) trapped more soil than it lost.

Good growth of fall wheat on loam soil near Sublette, Kansas, pulled through the severe windstorm of February 19, 1954, and went on to maturity.



Woodland Conservation Around Monterey Bay

DONALD E. KRIDER AND ROBERT A. DELLBERG

When you make plans to attend the 1957 annual meeting of the Soil Conservation Society of America at Asilomar Beach State Park on the Monterey Peninsula of California, leave extra time in your schedule. There'll be a lot of fascinating ways to use any unallotted time, particularly if you have any interest in the rich beauty and history of the Pacific coast. In this short article, the authors tell something of the part trees have played in the history—and conservation—of the Monterey Bay area.

THE Pacific Ocean area of California around Watsonville and Monterey Bay is rich in history. It is unique in many other ways. A favorable climate, a variety of soils and topography make it a rich agricultural area for the production of specialty crops. One important phase of the early history of the area is its association with trees.

Discover Giant Redwoods

Here white men first saw the giant redwood trees. Father Juan Crespi in 1769, near the present site of Watsonville, wrote of his discovery in the following manner:

"About eight o'clock in the morning we set out northwest. We could not make the march as long as intended because the sick men were worse and each day their number increased so we must have traveled but little more than one league over plains and low hills, well forested with very high trees of a red color, not known to us. In this region there is a great abundance of these trees and because none of the expedition recognizes them, they are named redwood (palo colorada) from their color. We stopped near the lagoon which has a pasture about and a heavy growth."

Father Crespi and his men had discovered the now famous Coast Redwoods, *sequoia sempervirens*, one of the natural wonders of the world.

The settlers who followed the early explorers and gold seekers to California found that redwood lumber manufactured from these trees was very suitable for their use. Thus, logging and saw milling were the first major industries. By 1900 there were over 200 saw mills in this area, where now only two small mills operate. These two mills are sawing either second growth timber or scattered old growth redwood and Douglas fir trees. These old growth trees were not cut earlier because of inaccessibility or lack of size.

Following the clearing of the land, livestock production, the growing of grain crops and the production of potatoes became the major agricultural pursuits. Some areas of highly erosive soil were cleared. These became a serious erosion problem. Sheet and rill erosion, huge gullies and streambank cutting were all too common. Every storm took its toll of tons of valuable topsoil. This material filled the stream channels and caused flooding and attendant flood damage of the land lying along the water

Donald E. Krider is soil conservationist, S.C.S., Watsonville, California. Robert A. Dellberg is forestry technician, S.C.S., Ukiah, California.

Peterson gully in 1943. Average depth was 30 feet. Now see the photo at right for the same spot after treatment. S.C.S. photos.

Peterson gully in 1955. The gully is starting to heal and trees deserve a lot of the credit. This is the same gully shown at the left.

Gullied area on Charlson Ranch in 1936. Vineyard (upper right) has been abandoned. Same area is shown below after conservation treatment. S.C.S. photo.

courses. Economic loss resulted, not only to the upper watershed land, but also to the residents living along the downstream sections.

The problem was first attacked by the Soil Conservation Service in the Corralitos Creek Demonstration Project during the period 1935-1941. This area is now a part of the Pajaro Soil Conservation District.

There are about 18,000 acres of timber land in the Pajaro District. Some of this has been planted and some has seeded in naturally. Plantings of such species as eucalyptus (blue gum), Chinese elm, Monterey pine, Redwood, Coulter pine, Black locust, Douglas fir, and Knobcone pine have been made. Areas that have restocked naturally contain redwood, Douglas fir and various native live oaks. It is expected that trees both in plantations and natural stands will continue to contribute to the economy of the community.

It was apparent to the directors of Pajaro Soil Conservation District and Soil Conservation Service technicians that the best method of stablizing these critical slopes was to plant them to trees. During the six-year period, 1935-1941, three-quarters of a million trees were planted on 120 different farms. Thirty different species of trees were used in these erosion control plantings. This program of tree planting has been continued and 447 additional acres have been planted by district cooperators.

Valley soils in the Pajaro District are old Marine terraces, usually sandy loams to loams, and are highly susceptible to erosion. They are also low in fertility and moisture-holding capacity.

Upland soils are formed from sandstone and are fairly stable when left in native woodland cover. When left in good vegetative cover, the infiltration rate of these soils remains good. On hillside orchards, however, the rate of infiltration is greatly reduced because of cultivation, and sheet and gully erosion are quite active.

Most of the trees that were selected for the original planting program were of quick-growing species such as Monterey pine, eucalyptus, and black locust. These grew rapidly and quickly provided suitable cover that stopped serious soil loss. Not much redwood tree planting stock was available but those that were planted have grown well and survival has been satisfactory.

Fred Wilkinson was one of the first ranchers of the area to plant trees to control erosion. He had to find some way to control erosion or abandon his farm. Tremendous amounts of silt had to be removed from his barn and driveway after every storm. After one particularly severe storm the county road adjoining his property was not

Gully stabilized by plantings of black locust and Monterey pine. This is the same area shown in the photo above. S.C.S. photo.

Badly eroded area on Mary Thomas ranch had just been retired from cultivation and planted to trees when this photo was taken in 1938.

cleared of silt. It was cheaper to rebuild the road on top of the silt than to clear it!

In desperation Wilkinson planted trees, almost as a last resort. He planted Monterey pine and eucalyptus on the seriously eroding hills above his home. These trees, planted in 1938, are now about 100 feet tall and have completely stabilized the eroding hills. He also cuts fuel wood from the area. After eucalyptus are harvested their sprouts quickly cover the area.

Wilkinson is convinced that trees enabled him to continue living in his home.

Plantings made on the Charlson ranch in this area in 1936-37 gave an excellent stand of trees. Here, an eroding hillside was rapidly becoming gullied. The present owner reports that even during the severe storms in December of 1955, no significant soil loss occurred. Black locust was planted in the gullied areas and Monterey pine on the adjoining lands. On this residual soil, formed from sandstone, Monterey pines are now about 65 feet high and eight to twelve inches in diameter. Some natural reproduction is occurring.

This is the same area shown in the photo at the left. The whole area was stabilized when re-photographed in 1956. S.C.S. photos.

The Thorburn ranch was also planted in 1936-37 with equally good results. Here Monterey pine are about 65 feet high and 18 inches in diameter. There is an excellent blanket of needles on the ground and erosion stopped where the trees were planted. The present owner, well aware of the erosion problem, maintains a good cover in the area.

The M. V. Rodgers ranch in Larkin Valley in the Pajaro Soil Conservation District also had a serious erosion problem. On this ranch, plantings of eucalyptus, redwood, Douglas fir, and several varieties of hardwoods have completely stabilized the steeply sloping lands that were formerly cultivated. Of particular interest is a steep slope just below the house. Here the trees stopped soil loss and form a beautiful setting for the residence.

Plantings such as these have proved to the community that trees are important in a conservation program. In some cases, they have other values, too. Eucalyptus trees can be used for fuel wood or harvested for pulp. Selective harvesting of others can provide saw logs.

This eroded hillside on the Bill Wise property was returned to forest cover soon after this photo was taken in 1943. S.C.S. photos.

The hillside looked like this in 1955. But some active erosion was still evident—largely where Eucalyptus trees had been planted.

Cooperative Snow Surveys and Water Supply Forecasting

R. T. BEAUMONT

R. T. Beaumont

In the mountains of the western United States, Nature has given man a truly convenient manner for collecting and providing limited storage of water. This is accomplished each winter as the snows accumulate and the life-giving water is stored until spring temperatures release it. The runoff during the growing season of practically all river systems originating in high mountains of the western states is from snow melt. This phenomenon was responsible for the concept of snow surveys. Snow surveys, in combination with other watershed data, provide the basis for water supply forecasts.

A SNOW SURVEY is an inventory of available water present as snow on a watershed. Each winter and spring hundreds of snow surveyors trek thousands of miles into the mountains to pursue this accounting procedure.

Snow surveys begin usually in January or February and continue through the snow season until April or May. Many hundreds of snow surveys are repeatedly taken at snow courses. A snow course is defined as a permanently marked area in the mountains where snow surveys are taken each year.

Measurement of a snow course or making a snow survey usually consists of from 10 to 20 samples, spaced 50 to 100 feet apart. Each sampling point on the snow course is mapped and snow samples are always taken within a radius of a few feet at the same point. Locations of snow courses may be in open meadows, along mountain roads, or in timbered areas. Precautions are taken to locate snow courses where drifting will not occur.

Snow survey sampling equipment consists of a light weight, seamless aluminum tube of 30-inch sections. Sections are coupled together to give any necessary length. The bottom section is tipped with a circular-edged cutter for penetrating hard snow or ice layers. The sampler is forced vertically through the snow to the earth's surface beneath. Depth of snow is indicated on one-inch graduations stamped on the sampler.

The tube with its snow core is then weighed on a small scale and the quantity of water in inches is determined. The tube has an inside diameter such that one ounce of snow core taken in this manner represents one inch water equivalent. The snow is a mixture of water and air, but the significant numerical value obtained from the snow survey is the water content of the snowpack.

It is important to note that the snow surveys do not necessarily measure the total volume of water stored as snow within a drainage basin. They measure, instead, the water content of the snowpack along the related snow courses. The information from a few snow courses in a large drainage basin thus provides an index to the snow-water accumulation over that watershed.

Early Snow Surveys

Historically, the first surveys in the United States were made around the first of the century. Charles Mixer, an engineer employed by the Rumford Falls Power Company in Maine's Androscoggin Valley, first made water content observations of the snow in March 1900 for the purpose of relating it to the spring runoff.

Almost simultaneously in 1909-1910, snow surveys were

Arizona snow surveyors measure off exact location of snow sampling point on a snow course in the Salt River watershed. S.C.S. photo.

R. T. Beaumont is analytical statistician, Snow Survey and Water Supply Forecasting Section, Soil Conservation Service, Portland, Oregon.

Montana snow surveyors are shown weighing a "core" of snow to determine water content of the snow. S.C.S. photo.

started in Utah and Nevada. George D. Clyde, now Governor of Utah and pioneer in water conservation, established the present state-wide snow survey network in Utah. In Nevada, under the leadership of J. E. Church, the concept of snow courses and snow surveys received momentum for its later growth in the western states. Irrigators and farmers immediately realized the value of snow surveys. Many of the first watershed networks were established in cooperation with irrigation districts and canal companies. This initital cooperation has since become the foundation of the Cooperative Snow Surveys in the West under the leadership of R. A. Work.

Description of Snow Survey Operations

In the western states there are at present about 964 snow courses being measured and coordinated by the Soil Conservation Service. In addition to these, there are 257 snow courses in California. The snow survey activity in California is coordinated and directed by the California Department of Water Resources.

Across the United States-Canadian border in British Columbia the Provincial Department of Lands and Forests measures and collects records on 80 snow courses. The data collected by the government of British Columbia are promptly made available to hydrologists and engineers in the United States. The exchange of data is particularly important in the management of reservoirs on the Columbia River, inasmuch as approximately 40 percent of the seasonal flow (April-September) originates in Canada.

Water Supply Forecasts

In general most streamflow forecasts are made for the total volume of runoff for a period of consecutive months beginning with the spring freshets from snowmelt water just after the maximum accumulation of snow water has occurred on the watersheds. These seasonal forecasts, which are needed for a period less than the water year, usually are for the period of April-September. It is in this period that farmers, irrigators and other water users have the greatest need for water. This period coincides with the growing season and is the period of least rainfall in the arid West. Some forecasts, particularly those on smaller streams, may be for the period April-July, inclusive.

The earliest requests for streamflow forecasts were from farmers who diverted water for irrigation. In the West where water rights are usually based on the principle of prior appropriation and use, it is imperative that advance knowledge of the seasonal flow be available.

Seasonal forecasts for the growing period enable irrigation districts to determine in advance and plan for water allotments to their water users.

Planting and other agricultural operations in irrigated areas, of course, are dependent upon the amount of water available during the growing season. Many farming areas and soil conservation districts use water supply forecasts to govern their farming operations. In areas where there can be considerable variation in water supply, types and acreages of the crops planted vary with available water to be expected.

In years of low supply, acreage may be reduced and crops requiring late season water supply, such as alfalfa or irrigated pastures, are reduced. Conversely, in many years with the prospect of an abundance of water, greater acreage can be planted and additional income can be realized. *Thus, the water supply forecasts result in more efficient conservation and use of soil and water resources.*

Special forecasts are made where local conditions re-

quire them. Forecasts of the lowest expected flow for the growing season are made. Such a forecast gives farmers with late water rights an idea of how long their water supply can be expected to last.

Forecasts Help Avoid Flood Damage

Advance forecasts of the seasonal flow make possible efficient reservoir operations. Whenever seasonal flows of flood proportion are expected, releases are made from irrigation reservoirs in order to reduce expected peak flows with confidence that the reservoirs will later fill to capacity. Small and large irrigation reservoirs throughout the West contribute their part to reduce flood damage each year whenever flows of flood proportion are expected.

Forecasts of the streamflow seasonal volume are indispensable for the operation of large, multiple purpose reservoirs on the main stems of western rivers. Most large reservoirs are operated on a cyclic basis. Operating plans are such that the reservoirs are filled during the spring and summer months with the melting snow waters of the previous winter. Releases and diversions for irrigation are also made during this period. As fall approaches, the reservoirs are mainly operated to increase streamflow for power production. In mid-winter and early spring when the flows of western rivers are at their annual minimum, releases are made from the reservoirs for power production.

Better Use of Storage Water

In several instances in the Columbia Basin unscheduled and additional storage releases have been made possible each spring when streamflows have been lowered due to cold weather as snow surveys have indicated that the coming seasonal flow would be sufficient to make up the releases and refill the reservoirs for the coming year.

Shown is a deep snow pack covering Mt. Jefferson and surrounding areas in Oregon. These snow packs form one of nature's largest reservoirs of useable water. S.C.S. photo.

A more dramatic effect of the information collected by snow surveys is its use by agencies concerned with the responsibility of flood protection.

Major floods caused by snowmelt can be fairly accurately forecasted from a relationship between total volume flow and the peak flow or highest flood flow. These relationships can be determined in advance for snowmelt rivers. After the snow surveys have indicated the total volume flow to be expected, a flood forecast can then be made of highest peak flow expected.

Helps Flood Protection

The U. S. Corps of Engineers using these procedures in the spring of 1956, at which time a record snowpack was observed in the Columbia Basin, executed protective measures two months in advance of the flood. It was reported by the Corps that 37 million dollars worth of flood damages were averted due to these protective measures taken two months in advance of the flood.

Many western watersheds in the spring are particularly vulnerable to floods caused by warm rains on snow. An inventory of this snow cover is made in some of these watersheds by snow surveys, thus enabling agencies con-

Vast snow packs contain water that is released during summer months. From water content and amount of snow, water supply can be predicted for years when temperatures are near normal.

Snow-fed mountain streams like this one supply water for most western rivers. Snow pack determines, to a large extent, how much water these streams are likely to carry in summer.

cerned with flood protection to consider this added contribution to any excessive rain that may occur.

Errors in Forecasting

Sources of error in seasonal water supply forecasts can be attributed to factors unknown at the time of forecasts and to future hydrologic events which occur after the forecasts are made.

At present the principal elements are measured and used to make forecasts of water content of the snowpack, spring rainfall, base flow of the streams and soil moisture. Of these only a small sample is obtained. Many other physical elements, evaporation, consumptive use of water by vegetation, channel losses, et cetera, which are known to influence runoff are not used. The lack of knowledge about their exact contribution in their hydrologic role and the lack of quantitative measurement of the elements are usually the reason why these elements are not used in forecast procedures.

Source of Error

Future hydrometeorological events can provide in many instances the largest source of error in seasonal streamflow forecasts. In some watersheds spring and early summer rainfall can contribute a volume of water greater than that derived from the snow melt. This is particularly true for rivers in the southwestern part of the United States.

Nevertheless, for the majority of the western rivers seasonal April-September flow results mainly from melt of accumulated mountain snow. It is, therefore, not surprising that the most acurate system at present for forecasting streamflow for this period uses snow survey data as a basis.

Errors of all forecasts made by the Soil Conservation Service and cooperators range from an average error of 11.3 percent for the state of Washington to 55.7 percent for the state of New Mexico. The larger error in New Mexico results from spring and summer rainfall contributions. The average error for all forecasts in western states, some 6,358 forecasts dating back to 1922, is 23.5 percent.

Continuous Reviews

Gradual improvement in forecasts is occurring as records have lengthened and as more refined procedures are applied. Continuous reviews are made in order to improve forecast procedures. Dependable weather forecasts of 30 to 90 days in advance of the seasonal water supply forecast would, of course, provide an increase in forecasting accuracy.

Additional basic data are being collected and more accurate observations and measurements are being made as interest in water resources grows. Networks of electrical resistance type soil moisture units which give an index to watershed soil moisture have been established by the Soil Conservation Service and cooperators. As these rec-

Snow surveys in Utah. Special over-snow machines are used to reach the water-producing areas of western watersheds. S.C.S. photo.

ords lengthen, this information will be incorporated into forecast procedures in an effort to further reduce present errors.

Growing Demand for Forecasts

Growing attention is being given to the primary importance of watersheds as water producers. This is attested by the following statement made recently by the Arizona watershed program staff concerning water yields in Arizona: *"Water production is now the most important use of the state's land surface above 3,000 feet elevation."* This increased importance in water yields will necessitate the collection of additional hydrologic information to efficiently manage these water yields.

Additional snow courses and watershed soil moisture stations must be established to provide basic information from the watersheds where measurements are insufficient or lacking in order to develop management procedures. Streamflow recording stations for small tributaries must also be included as an integral part of these observations.

Greater utilization of small tributaries has increased the importance of small watersheds. The very nature of hydrometeorologic elements are such that it is nearly impossible to extrapolate observations from one watershed to another with sufficient accuracy to be of value. Thus, networks which are sufficient for solution of hydrologic problems in large watersheds do not efficiently serve small watersheds.

Already pilot studies of watershed treatment are being made, and others are contemplated, to develop management procedures in order to increase water yields consistent with good land and water conservation. Cooperative snow surveys and streamflow forecasting will continue to have a major role in management procedures developed.

This reservoir in the Colorado Rockies depends on snow melt to provide water for power and irrigation. S.C.S photo.

Fresh Water Marshes—Future Bread Basket

ROBLEY N. JOBE

Over much of the world, population is increasing. Already, millions of the world's families find themselves short of an adequate—let alone desirable—diet. Once international distribution problems can be solved, we no longer have so-called food surpluses in the United States. In fact, the problem may immediately shift to one of getting maximum sustained production. Lacking satisfactory world-wide distribution, there still looms ahead a time when this country alone may need added acres to maintain desired dietary standards. One small segment of the solution to this problem lies in the fertile fresh water marsh lands of coastal Georgia. Here's more about the area and what can be done to make it more productive.

THE BIG Satilla River starts on its way as a small trickle in Ben Hill County, Georgia. By the time it reaches the Atlantic Ocean some hundred miles away, it has wound through eight counties in southeast Georgia. The small creek has picked up many streams by this time and has changed from a small trickle to a river that will float a medium size battleship. Twenty-five miles before the river outlets into St. Andrew's sound it flows through Camden County, Georgia.

Camden County is located in the southeast corner of Georgia, bounded by the Atlantic Ocean and the state of Florida. The total area of the county is a little over 400,000 acres.

Along the banks of the Big Satilla in Camden County, there is a wide flat area that is flooded by tide water twice each day. This area is also covered with a dense grass known locally as "marsh grass". Marsh grass is high in feed value and is grazed by cows when the tide is low and when the ground is firm enough to support their weight. The only wildlife found in the areas is a small number of marsh hens.

For centuries the Big Satilla and Atlantic Ocean tides have deposited rich top soil and marine clays to make this one of the most productive areas known to man. The top soil has been washed in from the 2,800,000 acres of the Big Satilla watershed. This alluvial soil ranges from 10 to 40 feet deep.

Fresh Water Marsh

There are approximately 20,000 acres of this flat land along the Big Satilla banks that is classified as *Fresh Water Marsh*. This land is far enough from the Atlantic Ocean that tidal effects do not deposit salt, except under unusual hurricane conditions. Even then, salt deposits are so small that they have no adverse effects on crop production.

Taxpayers of the United States have spent a large sum of money in the last 30 years to help farmers tie down the top soil in the rolling fields of the Big Satilla watershed. Only a small amount of tax money has gone to begin development of the fresh water marsh lands. Yet, one improved acre of marsh land will produce ten to twelve times as much as an acre of hill land in the watershed.

Development of this marsh land is too expensive for landowners to attempt without long time loans from some source. This 20,000 acres of fresh water marsh is only a portion of the total 180,000 acres located along the coast of Georgia. Properly developed, this area could become Georgia's "bread basket."

The potentialities of this land have been well illus-

Robley N. Jobe is area conservationist, Soil Conservation Service, U. S. Department of Agriculture. He is located at Waycross, Georgia.

This is typical of Georgia's fresh water marshland before the river is diked out. Note heavy growth of marsh grass. S.C.S. photo.

Sesbania, a legume, is grown following lettuce to supply both nitrogen and organic matter. Shown is C. D. Sims, Jr., S.C.S. technician.

trated on Woodbine Plantations. The owners, H. S. Brenner, Sr., and Sons, have 600 acres of fresh water marsh land on the banks of the Big Satilla.

"Pop" Brenner bought Woodbine Plantation in 1943. Two years later he made application to the Satilla River Soil Conservation District for assistance in developing every acre of this land according to its capability. Soil Conservation Service personnel assigned to the District worked with the Brenners by giving technical assistance in planning and applying the practices established.

The first work, constructing outside dikes to prevent overflow of tide water from the Big Satilla, started in 1953. These dikes are six feet high, 36 feet wide at the base and 12 feet across the top. Around the foot of the hill land which otherwise drains through the area is a large canal to divert runoff water into the river.

Ditch shown behind H. S. (Pop) Brenner drains land inside the dike. Dike is shown at the extreme right. S.C.S. photos.

Due to the vast amount of marsh vegetation found on this land, two years of disking and trash cleaning were required before planting could be made. Seven to ten tons of limestone per acre were required before the soil was sweet enough for crop production.

Lettuce fields are laid out in blocks that have quarter ditches centered 66 feet apart, permitting the planting of 10 beds of lettuce per block. Lettuce is planted on a 45-inch crown bed with three rows to the bed.

Prior to planting, a ton of 6-8-10 fertilizer is disked into the soil. Before germination of the lettuce, 35 pounds per acre of DDT dust are applied to kill the ever-present cut worm. Later, various poisons are used as needed to kill insects and diseases.

An average crop produces 175 to 225 crates of lettuce per acre. Two crops are grown annually. Harvest time is

Marsh land is productive. Shown is lettuce harvest on marsh land now protected from tides and overflow by the dike in the background.

in April and May and November and December of each year. During the idle summer months fields are planted to a cover crop called Sesbania. Sesbania supplies both nitrogen and organic matter. In this way the soil is maintained—even improved.

How is this work affecting wildlife? "Pop" Brenner says, "Since this work started we have an increase of both ducks and geese. You see, we have increased the food supply for all kinds of wildlife. The best way to increase wildlife is to increase their food supply. This we've done."

The Brenners have shown what can be done with much of the fresh water marshland. This undeveloped marsh land could truly be the future bread basket of Georgia.

Make Full Use of Stored Soil Moisture

VERNON C. JAMISON

Nearly all sections of United States, including the humid East, have days during the crop growing season during which a shortage of plant available moisture limits crop growth. Many farmers can reduce the number of these days by making more effective use of the capacity of their soils to store plant available moisture. The author reports on methods for doing this. You'll note that a lot can be done to help soils take in more of the moisture that falls. But relatively little can be done to increase the total capacity of a soil to store plant available moisture.

ONE OF THE vital functions of soil is that of holding a supply of moisture available for use as needed by crop plants. Ideally, soil moisture is re-charged regularly throughout the growing season by rainfall. But through most of this country natural precipitation is marked by periods of surpluses and deficits. Soils vary in their ability to store moisture during the surplus periods for use by plants during the deficit periods. This variation is due both to storage capacity and effective use of that capacity. Often the ease with which water enters into a soil is confused with the amount that soil can store for plant use.

Storage Capacity

The storage capacity for plant available moisture is that quantity of moisture which a soil can hold between its field capacity and its wilting point.

Field capacity is the moisture remaining after a soil is thoroughly wetted and allowed to drain about two days. Further drainage is slow. Additional moisture removal, except for the surface few inches, will depend mostly on how fast it is withdrawn by plant roots.

The moisture content of the soil at which most plants wilt is called the wilting point—or wilting range since this varies through a rather narrow range for any given soil.

The available moisture storage capacity, the difference between field capacity and wilting point, is usually expressed as a percentage of the total soil volume or in inches of water per foot of soil. The size of this available moisture storage capacity varies widely among soils of different textures.

Sandy soils usually have a low moisture storage capacity. Most of the pore space is filled with air rather than water at field capacity. Most of the pore spaces are comparatively large in size. Water drains thru them quickly and easily. A relatively small amount of moisture is able to resist drainage and remain in the sandy soil.

On the other hand, clay soils have a high total moisture storage capacity. This is because the pore size in clay soils is quite small. Water moves slowly through the small pores and larger quantities of water resist drainage.

Unfortunately, the available moisture storage capacity of clay soils is usually only fair to good. The extremely small pore spaces hold the moisture against drainage. They also hold more of it against the "pull" of plant roots.

Silty soils, with pore spaces ranging between those of clay and sand in size, are usually high in storage capacity for available moisture. Some hold between two and three inches of available water in each foot of soil. However when silt particles are plate-like in shape and arranged

Living intercrops between rows can help protect the soil surface. Shown are oats growing between wide-spaced double rows of corn.

Vernon C. Jamison is soil scientist, Agricultural Research Service, U. S. Department of Agriculture. He is located at the University of Missouri, Columbia, Missouri.

Leaving crop residues pinned in the soil surface reduces runoff and speeds water intake. But it does not increase storage capacity.

This photograph shows a subsoiler being operated on the contour to increase the water interception on pasture land.

in compact layers, the moisture storage capacity may be considerably less than if these particles are arranged in a more random manner. Silty soils may also contain clay particles which can partially clog the larger pore spaces and reduce available moisture storage space.

The "ideal" soil is one containing small, medium and large pores in proportionate amounts. The large pores drain quickly and ventilate the soil mass, supplying oxygen to and removing gaseous wastes from the plant root zone. The medium pores conduct water and provide some storage for water that is easily available to plants. The small pores provide additional storage.

This condition can be approached by mixtures of course and fine particles. But combinations of medium and fine particles bonded together by natural glues and cements into stable aggregates probably comes closest to the ideal. If such a soil is kept moderately loose by tillage, the spaces around the aggregates are large enough to facilitate water movement and provide good soil ventilation. The spaces within the aggregates retain and store moisture for plant use. The particles are arranged and held together so as to provide a good distribution of pore sizes. Such a soil is said to have "good structure."

Texture Hard to Change

Obviously, there isn't much one can do about either the total or available moisture storage capacity of a particular soil, since texture is the determining factor. It is seldom economically practical to add enough silt or clay to a sandy soil to significantly increase the moisture storage capacity. Even addition of huge quantities of organic matter will not add much to available moisture storage space. As with clay, much of the moisture retained by organic matter is unavailable to plants.

Fortunately, there are ways to increase the speed and ease with which available moisture storage capacity is filled during surplus moisture periods.

The surface seal, or soil crust, is the most common bottleneck in getting moisture into the soil. The beating action of raindrops—or the impact of irrigation sprinkler droplets—tends to break down the crumb-like structure of surface soil. The result is a compact, single-grain surface layer which takes in water slowly. Of course, that means loss of water and of soil, particularly on steep slopes. Upon drying, the surface seal often forms a hard crust which may even prevent some seedlings of crop plants from coming up.

Mulch Improves Stability

A cover crop or mulch can be added to overcome this poor stability of surface soil structure. This absorbs the impact of the raindrops before they reach the soil. Structure stability can be improved by plowing under crop residues, cover crops, or manure. Somewhere during decomposition of these organic materials, natural glues or cements are produced. These materials seem essential in producing stable soil aggregates.

Cultivation brings temporary relief to a crusted condition. Cultivation and tillage also seems to give other, though somewhat indefinite, benefits. Soils left undisturbed for some time often do not wet as readily as after cultivation.

The reason for this isn't clear, but probably some of the storage pores are blocked by organic gums or by clay particles. If so, stirring the soil apparently re-opens the passages permitting easier passage and storage of water.

Some sandy soils containing organic matters but little clay are hard to re-wet after drying out. Cultivating these soils will often speed water intake.

Chemical structure stabilizers, or "soil conditioners,"

(various gums, polymers and asphalt base powders and sprays) have been tried for stabilizing surface soil aggregates. So far, the cost of these materials is high and their use is largely limited to greenhouse work, roadbank stabilization and similar projects where the return justifies the expense. For general field use, farm manures and crop residues are about as effective and their cost is more in line with cash returns.

Dense soil layers, or "pans" in the soil, may reduce moisture storage efficiency, too. When the surface isn't sealed, the soil pores above such a dense layer may be filled with water while further wetting of subsoil below awaits slow water penetration through the dense layer itself. Because of this, valuable moisture may run off or remain standing in surface ponds.

Subsoiling May Help

Sometimes this condition can be greatly improved by deep tillage or subsoiling. But the bottleneck layer must be near enough to the surface to be within reach of deep tillage tools. The layer must be broken to allow movement of water through it into the deeper and more permeable soil below.

Subsoiling on deep, tight clay soils is not only more expensive, but is little better than normal tillage. Under some conditions, excessive loosening of the subsoil may hinder rather than help moisture storage. As water moves into the soil, it fills the small and medium pores first. Only as the soil approaches saturation does the water move into the larger air-filled pores, cracks and channels. Before that point is reached, water is virtually "sucked" from wetter layers into the drier pores of a similar or smaller size. Since rupturing a dense layer may break contact of conducting pores, and substitute large spaces in their place, an increase in downward movement of soil moisture occurs only when the soil is quite wet. Excessive loosening may increase evaporation, too. So where subsoiling is desirable, it should be done before a rainfall season and at a time when the dense layer is dry enough to shatter.

A number of methods of trapping rainfall are used to advantage in many areas. On gently sloping land, much of the water from short, heavy rains may be lost as runoff due to surface sealing. But pockets or intake furrows cut into the soil surface can collect water and hold it until it soaks into the soil for storage.

Contour plowing and leaving crop residues on the soil surface are examples of other ways to slow runoff and improve moisture intake and storage.

Much that is gained by good practices to increase soil moisture storage is quickly lost if weeds are allowed to rob the crop. Weeds not only steal fertilizer "plant foods" and sunlight from the crop but compete for precious stored water, too. Cultivation, chemicals and flaming have been used to control weeds.

The crop must also be protected from insect pests and plant diseases to insure most effective use of stored soil water. Chemicals can help control insects and some diseases. Also, disease and insect resistant strains of some crops are being produced by plant breeders.

Space Crop Right

The spacing or "stand" of a growing crop should be adjusted to make the best use of sunlight, soil moisture, and plant foods available in the soil. It is thought that if nutrients and moisture are kept at a high level the density of stand one can use will depend on available sunlight. Usually, the stand one attempts to get is suited to the expected supply of stored soil moisture, rainfall and available irrigation water. A very heavy stand of

Subsoiling may not pay unless the entire layer of compacted soil (pan) is shattered. Note here that the subsoiler, working at full depth, reaches only to the top of the pan. S.C.S. photo.

Rapid removal of surface water is needed if natural runoff and intake are too slow to handle normal precipitation. S.C.S. photo.

some crop plants in dry land areas will exhaust soil moisture in early growth leaving no reserve to mature the crop.

Soil fertility can be adjusted to the expected supply of soil moisture so as to make the best use of the stored soil moisture plus expected rainfall or irrigation water. In 1953 tests in Missouri showed that adding an adequate supply of fertilizer to corn increased the withdrawal of moisture from the soil as compared with corn getting no fertilizer. However, with no fertilizer it took four times as much water to produce a bushel of corn as with adequate fertilization. The next year neither fertilized nor unfertilized plots produced a crop. During the prolonged drought of 1953-54 the moisture reserves of this soil were not replenished. Extra fertilizer can help a crop make better use of the moisture supply, but it will not substitute for moisture. In dryland wheat areas fertilizer may help crop production. But an over-supply of soil nitrogen can stimulate early growth which depletes the moisture supply before the wheat matures. The result is a crop of dry, grainless straw.

Need Rain or Irrigation

Even when the available moisture storage capacity in the root zone is filled before planting time, the quantity is usually insufficient to produce more than a fair crop unless supplemented by rainfall or irrigation. John Thornton at Athens, Georgia, found that cotton used only about three inches of water from stored soil reserves whether supplemented only by 11 inches of rainfall during the growing season or by the rainfall plus irrigation. Yields were better when water was added after moisture storage reserves dropped to 60 percent than if applied when moisture reserves were less. However, more cotton was produced per inch of water used where water was applied sparingly—that is, after available moisture was exhausted in the top two feet of soil. Thus, where irrigation water is available, the cost of application should be considered in order to make the best use of the irrigation water supply.

Adjust Harvesting Dates

Profitable crops suited to the soil and climate should be chosen to make the best use of stored soil moisture. The planting and harvesting dates should be adjusted to seasonal climate and periods of rainfall.

The future promises improved crop varieties and better control of weeds, insects and diseases. Crop growth may be stimulated by chemicals—gibberellic acid, for example. All this should give more effective use of moisture. In any case, stored soil moisture along with rainfall or irrigation will be needed to produce crops, then as now.

Michigan Chapter Promotes Conservation

ALAN W. IRVINE

Over 4,500 Michigan boys, all Future Farmers of America, took part in the 1955-56 Soil and Water Conservation Activity. Eighty FFA chapters in 38 counties were involved. This compares with less than 300 boys in 1953 when the activity was started. The venture has been a success from the start. Participation has increased every year. The Soil and Water Conservation Activity is jointly sponsored by the Michigan Chapter of the Soil Conservation Society of America and the Kellogg Company of Battle Creek, Michigan. This is another example of the many worthwhile things chapters of the Society can do.

THE IDEA for the Soil and Water Conservation Activity in Michigan was developed early in 1953, at a meeting of the Michigan Chapter of the Society. The meeting had been called to plan an activity to replace an unsuccessful essay contest sponsored by the chapter and the Kellogg company. It was agreed that the essay contest for Michigan college students was not achieving its purpose, especially as there had been only ten participants for the ten prizes offered.

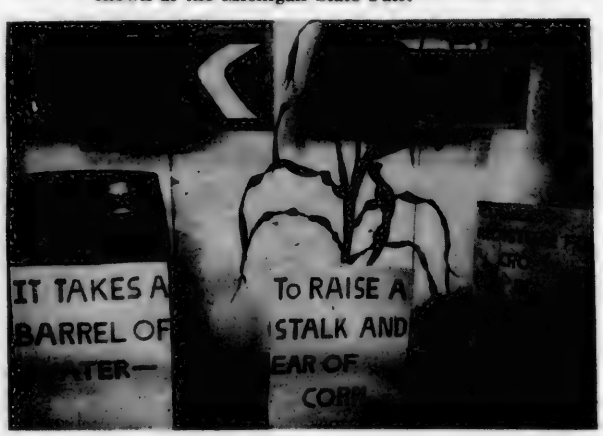
The Committee agreed that a program was needed that would encourage greater participation of school children and would also encourage conservation on the land. Working with a group already organized would simplify the problem of participation, and a group connected with farming would facilitate achievement in the program. The Future Farmers of America seemed to satisfy these requirements.

To Get Participation

To be successful, the program would have to be attractive to the FFA membership, and also to the vocational agricultural teachers who served as chapter sponsors. To win the approval of the teachers, the program would need to supplement both the classroom and the FFA program. It was at this point that the committee asked the assistance of the Vocational Agriculture Division of the Michigan Department of Public Instruction in setting up objectives for the program. To be successful the activity must (1) serve as a source of conservation education in the FFA program and in the classroom, (2) provide incentive for FFA participation, (3) help to develop leadership, and (4) encourage conservation on the land.

One of the many problems facing the committee was that of selecting suitable awards. It was decided that all awards would be presented to the chapter as a group, rather than to individuals. The state was divided into three areas. Three awards—Gold, Silver and Bronze—were presented in each area. The Gold Award was a two-day stay at th Clear Lake Youth Camp, near Battle Creek, Michigan, a tour of the Kellogg Company factory and a tour of the W. K. Kellogg Experiment Station, Farm, Forest and Bird Sanctuary, followed by a noon banquet at the Clear Lake Camp. Included in the award was a Soil Conservation Society of America plaque, membership in the Michigan Chapter, subscription to the JOURNAL OF SOIL AND WATER CONSERVATION, and individual recognition scrolls for members. Silver Award winners received a plaque and individual recognition scrolls. The chapter president and advisor were invited to the camp and the banquet. Bronze Award winners received individual recognition scrolls, and honorary scrolls

This conservation exhibit was prepared by the Sandusky, Michigan, Future Farmers of America. It was shown at the Michigan State Fair.



Alan W. Irvine is publicity chairman, Michigan Chapter, Soil Conservation Society of America, Jackson, Michigan.

for their chapters. Each participating chapter was presennted with an honorable mention scroll.

The contest is based upon five soil and water conservation activities, and a written report of the activities in which the chapter took part. The five activities are:

I. *Class activities in soil and water conservation.*
II. *Chapter activities in soil and water conservation.*
III. *Participation in planning and applying soil conservation practices.*
IV. *Cooperation with the educational program of Soil Conservation Districts.*
V. *Advancement of the soil conservation movement.*

Each of the above activities is divided into several sections. Points are given for participation in each section. For example, "Chapter Activities in Soil and Water Conservation" is divided into nine sections, such as: delegate on Soil Conservation District Youth Committee, 30 points; land-judging team participation in local contest, 30 points; chapter management of school forest, 10 points; chapter exhibits at state, county and local fairs, 10 points each; installation of soil conservation plan on school farm, 25 points, etc.

The activities report consists of a brief narrative description and two photographs showing chapter accomplishments in promoting the art and science of good land use.

When the program was first set up by the Activities Committee in 1953, it was hoped that specific results would be obtained. Some of the sought-for results were (1) an increase in the amount of classroom teaching in soil and water conservation; (2) emphasis on the chapter activities in soil and water conservation; (3) provide chapters with an incentive to apply conservation practices on the land; (4) bring about closer relations between Soil Conservation Districts and Future Farmers of America; (5) provide training for Chapter members by encouraging such activities as writing news articles, giving talks and demonstrations on conservation, and (6) provide encouragement for boys who will be our future leaders in the science and art of soil and water conservation.

In three years the five activities have produced the following results by the participating chapters:

I. Class Activities
1,114 hours of classroom instruction on soil and water conservation.
206 conservation field trips.
946 essays on conservation.
80 debates on conservation.
75 guest speakers on conservation.

II. Chapter Activities
53 chapters participated in local land-judging contests.

Land judging contest in Sanilac County, Michigan. The activities added together gave participants a good picture of conservation.

What kind of cover on these runoff plots? Future farmers find that a factor which helps control the amount of runoff and erosion.

How much soil down there? It had to come from the runoff plots. Such experiences make erosion and water loss problems come alive.

51 chapters participated in county land-judging contests.

20 chapters participated in state land-judging contests.

51 conservation exhibits displayed at fairs.

39 conservation exhibits displayed in public places.

33 chapters managed school forests.

13 chapters managed school forest nurseries.

12 chapters installed complete soil and water conservation plans on school farms.

III. Planning and Applying Practices

8,570 soil and water conservation practices were established on FFA members' farms.

181 agreements were signed with the local Soil Conservation Districts.

146 basic farm plans were developed with the local Soil Conservation District where complete planning for proper land use and soil treatment was carried out on each acre of the farm.

IV. Cooperation with Soil Conservation District

17 farm planning groups organized.

83 farm planning members secured.

35 Soil Conservation District annual meetings attended.

1,343 hours worked on Soil Conservation District sponsored events.

V. Advancement of Conservation

Organized or led 27 4-H Soil Conservation Clubs.

Assisted 55 organizations in carrying out conservation practices.

Published 158 news articles on soil and water conservation in local papers.

Presented 51 radio talks on conservation.

Took part in 5 television programs.

Gave 97 conservation talks before public groups.

Presented 72 conservation demonstrations.

The Michigan Chapter, Soil Conservation Society of America, is proud of the record of accomplishments which the Future Farmers of America have made. The activity satisfies most of the objectives set up by the Activities Committee in that it is of local benefit; serves as a source of conservation education in the FFA program and in the classroom, provides incentive for FFA participation, helps to develop leadership, aids in getting conservation on the land, and successfully competes with a large number of other activities available to FFA Chapters. Equally important, it has the approval of FFA members, Vocational Agriculture teachers and the Michigan Department of Public Instruction. The Kellogg Company has expressed its desire to continue its financial support of the program since it is a means of working with both youth and conservation.

The Michigan Chapter-FFA Activity in Soil and Water Conservation means a lot of work for a few people as past Committee Chairmen, Frank W. Suggitt, Robert George, Lester E. Mark, and present Chairman, Warren A. Blight, will testify. But all who have worked on the Activity will agree that the time has been well spent in developing a program that will encourage the youth of America to not only recognize our conservation problems, but to take an active part in correcting them.

Alan W. Irvine
Publicity Chairman
Michigan Chapter
Soil Conservation Society
of America

Drouth Proves Value of Storage Water

STAN MATZKE

Stan Matzke

Water is the controlling factor in crop production in much of the country. Where that is the case, it becomes one of the most precious of natural resources. Yet even in such areas, water may be abundant during parts of the year. So storage is a logical answer. The author compares 1934 and 1936 with recent drouth years to illustrate the value of stored water.

BUMPER CROPS were harvested on a half million acres of land irrigated with stream flow and Lake McConaughy storage water. This happened in the Nebraska portion of the North Platte and Platte Rivers watershed from Kearney west to the Wyoming state line. And it happened in spite of the fact that 1956 was the shortest water year of record.

Oldtimers will tell you that previous to 1956, the worst water year in the history of the valley was 1934. That year farmers fought for water, and it was necessary to keep up-river canal headgates closed to protect the rights of downstream higher priority irrigators. In 1934 the bed of the North Platte and Platte lay dry and parched from Oshkosh to Columbus most of the summer. At Grand Island no water flowed in the river from the first part of May until December 21.

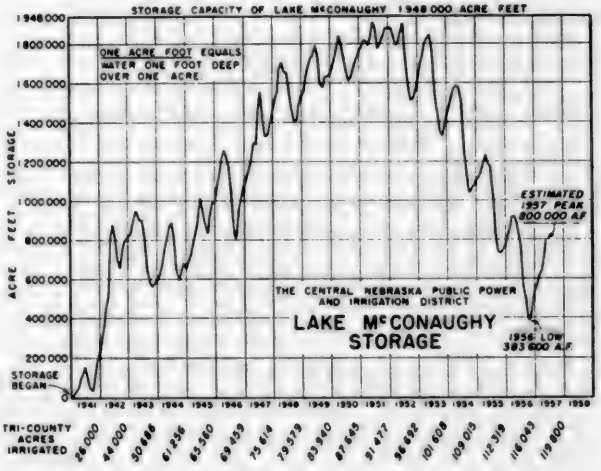
Tough as 1934 was, however, it was "wet" in comparison to 1956—at least from the standpoint of water available up the river.

The Central Nebraska Public Power and Irrigation District (Tri-County) which owns and operates Lake McConaughy checked records in the state Department of Irrigation. From October 1, 1955, to September 31, 1956, the inflow to the huge reservoir at its inlet at Lewellen was only 626,630 acre feet. This is 60.2 per cent of the 25-year (1931 to 1955 inclusive) average of 1,041,100 acre feet. And 1956 followed three years of low flows.

More Water in 1934

Now take a look at the water available up the North Platte River in 1934. Lake McConaughy was not in existence then, construction of Kingsley Dam not having been begun until 1935. For the 1934 water year records of the state Department of Irrigation showed the flow of the North Platte River at a point near Lewellen totaled 901,500 acre feet. This was 274,870 acre feet more than in 1956. And 1934 followed a year which was really "wet." In fact, the four flows preceding 1934 were all above the 25-year average. The stream flow in 1953-56 was almost 2,000,000 acre feet less than in 1931-34.

As for precipitation during the crop season, 1934 and 1956 presented about an even break in the irrigated areas. The western part received slightly less moisture



in 1956 than in 1934. But the area from Bridgeport to Kearney received less in 1934. Otherwise, the summer of 1956 was somewhat cooler and more humid. Of course, this favored crop production.

Yet, with less water coming down the North Platte River and drouth conditions about comparable, how could the river furnish adequate irrigation for 500,000 acres of bumper crops in 1956 when in 1934 less than 150,000 acres received irrigation and much of that inadequate?

The answer is *storage water*—water saved in Lake McConaughy since 1941 to grow crops and recharge

Stan Matzke is assistant manager of The Central Nebraska Public Power and Irrigation District, Hastings, Nebraska.

Dry irrigation canals during the crop season mean drouth-damaged crops and no recharge for ground water. This was common in 1934.

Irrigation supply canals that were dry in 1934 ran full through the 1956 drouth, thanks to storage water from Lake McConaughy.

ground water supplies in Nebraska in 1956. This same water would have mingled with the salt water of the Gulf of Mexico years ago had it not been for completion of Kingsley Dam in 1940.

By the end of the 1956 irrigation season, Lake McConaughy storage had dropped to 383,600 acre feet, the lowest since the spring of 1942 when the reservoir was on its initial fill. This water, some of which had been held in storage for over 14 years, made possible the finishing out of the 1956 corn crop. Yields ranging from 75 to more than 100 bushels per acre were common.

Saved Four Crops

Without Lake McConaughy storage water the past four crop seasons (1953 to 1956), few crops would have been harvested from the 116,271 acres of ditch irrigated lands in the Tri-County area (Gosper, Phelps and Kearney Counties) and the Supply Canal irrigated areas of Lincoln and Dawson Counties. The same holds true for 129,000 acres irrigated by the on-river canals in Keith, Lincoln, Dawson and Buffalo Counties which received supplemental storage water. The Lake McConaughy storage water influence also extended to thousands of acres irrigated by on-river canals from Ogallala to the Wyoming line where in 1934 headgates were closed in a vain attempt to get water down the river to canals with higher priority.

North Platte River near Lewellen measuring station. Most streamflow statistics quoted in this article were recorded at this point.

District Irrigation Records

July and August are the critical months of the irrigation season. The kind of a harvest a farmer will reap depends on what happens during these two months. So a comparison of what happened in the Platte river watershed during these months in 1934 and in 1956 is interesting—and instructive.

In 1956 some 1,500 water users received 332,100 acre feet of water 116,271 acres in Gosper, Phelps, Kearney Counties and on the Supply Canal.

No Crops in 1934

In 1934 there was no irrigation—and no crops—in this area.

Records of the state Department of Irrigation show a startling comparison between what happened on the eight

on-river irrigation canals from Kearney to Brady in 1934 and 1956:

Canal	Acre feet of Water Received in July and August 1934	1956
	acre feet	acre feet
Gothenburg	121	24,574
Cozad	0	19,183
Dawson Co.	1,148	35,966
6 Mile	0	1,177
30 Mile	24	35,892
Orchard & Alfalfa	0	6,468
Elm Creek	0	5,428
Kearney	111	4,963
Total Acre Feet of Water	1,404	123,651

Four on-river canals between North Platte and Ogallala also showed an interesting comparison for the two critical months:

Canal	Acre feet of Water Received in July and August 1934	1956
	acre feet	acre feet
North Platte	3,894	26,109
Keith-Lincoln	674	9,333
Sheridan-Wilson	141	1,018
Paxton-Hershey	123	8,112
Total Acre Feet of Water	4,832	44,572

Three other canals on this stretch of the river did not do so badly in 1934. Because of their priority, they were the beneficiaries of the water which got that far down the river after the state irrigation authorities gave up trying to get the water down the parched river bed to the headgates of the high priority Kearney Canal. But even these canals, although they were taking practically all the water that was left in the river during July and August of 1934, did better in 1956:

Canal	Acre feet of Water Received in July and August 1934	1956
	acre feet	acre feet
Suburban	7,488	12,502
Cody Dillon	2,542	2,880
Birdwood	2,932	3,467
Total Acre Feet of Water	12,962	18,849

The effect of storage water to supply downstream irrigators and more important, making natural flow available by furnishing a vehicle to get it down the river, was not only apparent below Kingsley Dam. Several upstream canals between Lewellen and the Wyoming line did much better in 1956 because their natural flow water did not have to be passed on down the river in a vain attempt to get it down to canals of higher priority. Here are a few examples of how canals above Lake McConaughy fared in 1934 and 1956:

Canal	Acre feet of Water Received in July and August 1934	1956
	acre feet	acre feet
Gering	4,304	15,151
Short Line	934	2,541
Last Chance	438	708
9 Mile	1,395	5,782
Lisco	1,208	1,997
Blue Creek	2,806	3,624
Total Acre Feet of Water	11,085	29,803

In years like 1934 canals like those named above take all the water they can get in July and August so it can be assumed that what they took was all that was available. A study of the above comparisons emphatically points up how much more water was available in 1956

Kingsley Dam and Lake McConaughy, eight miles north of Ogallala, Nebraska, on the North Platte River. Two million acre feet of water from the Rocky Mountains can be held here.

in spite of the fact that much less water was flowing down the river than in 1934. This was not only true at Lewellen where the 1956 flow was 274,870 acre feet less than in 1934, but also at the following points:

	1934	1956
	acre feet	acre feet
State Line	360,300	306,700
Mitchell	357,400	221,400
Bridgeport	663,600	480,920

The availability of Lake McConaughy storage water affects watershed water supply in three ways:

1. It furnishes irrigation water stored from previous years of excess flows which otherwise would be lost in the Gulf of Mexico.
2. It furnishes a "vehicle" to carry upstream natural flow water down the river. Seepage and evaporation losses are charged to the storage water. So downstream high priority irrigators like those on the Kearney Canal get their appropriation undiminished after its "piggy back" ride down the river on the storage water.
3. It creates natural flow which otherwise would not be in the river at all. On-river ditches run brimful from April to October each year and hundreds of thousands of acre feet of water are spread on watershed lands. This builds up ground water levels and increases return flow to the river. Water which otherwise would serve no beneficial purpose in Nebraska boosts July corn growth and at the same time creates return flow for further ditch irrigation and recharge for ground water supplies.

For example, the eight on-river canals in Dawson and Buffalo Counties during the 1956 irrigation season received 66,116 acre feet of storage water. And along with this storage water they got 194,320 acre feet of natural flow. On the basis of previous experience, there would have been no natural flow in the river at this point had it not been for Lake McConaughy.

Water for 1957 Season

Lake McConaughy storage is slowly creeping back up from its October 17, 1956, low of 383,600 acre feet. With winter's inflow, there will be about 800,000 acre feet in storage before the seasonal draw down begins—enough storage water for the 1957 and 1958 crop seasons even if drouth continues.

This will be the seventh crop season since the reservoir was full with almost two million acre feet of precious water in 1951. The yearly high water mark in the lake has fallen each year as drouth of increasing intensity has cut inflow and increased usage. But these are years in which Platte River watershed lands have grown bumper crops both on the hundreds of thousands of acres irrigated by ditch water and also on the like hundreds of thousands of acres of pump irrigated lands.

Shown is Johnson No. 1 power plant (one of four) below Johnson Lake on a supply canal which carries water from Lake McConaughy.

Water can serve many useful purposes. Shown here is a recreation development on Lake Maloney, south of North Platte on a supply canal.

Moderate Grazing—Key to Successful Ranching

HARLAN N. TULLEY

Dry weather has thrown a "monkey wrench" into operations of many ranchers. Yet, some have been able to adjust their operations enough to last out the periods of drouth. As you might expect, conservation practices contribute a big part of the success in these critical periods of drouth.

The author reports the story of a Wyoming rancher and the reasons why he is making out better than most.

THERE'S been dry weather at Tie Siding (Albany County) in southeastern Wyoming. But rancher Richard C. (Dick) Williams has a successful operation in spite of the drouth.

Rancher Williams lists three key points which keep him going strong:

1. *Moderate grazing of native grasses*
2. *Improved livestock quality*
3. *Renovation and fertilization of hay meadows.*

During these dry years, he gives moderate grazing much of the credit for the heavy calves he has to market. Grass that's left on the pasture provides a mulch which partly insulates the soil from drying effects of heat and wind. This mulch also helps more of the limited moisture available to percolate into the soil instead of running off the surface.

The result, of course, is more moisture in the soil. More moisture means more grass. And more grass means more pounds of beef to sell. The proof is in weaning weights of Williams' calves—about 400 pounds. That's exceptional for a plateau some 7,000 feet in elevation where the growing season is short.

Quality Livestock

Williams is in the Angus business with both purebred and commercial herds. His big blacks do well in the rigorous climate near Laramie, Wyoming. The cows are good mothers and they hustle for their grazing. Snow burn is no problem with them. Calves from Williams' quality stock put on weight fast. The average calf crop—about 90 percent—far exceeds the usual percentage for the area.

Calving usually begins about February 20, some six weeks ahead of most ranches in the area. The rough hills where calving takes place afford sufficient protection from late winter storms.

By the time the hay meadows are growing well, the calves are big enough to graze. Grass plus milk from the cow gives them extra growth.

By weaning time in the fall, the calves to be marketed are shipped right from the cow to the buyer's feedlot. A reputation for quality and fast gains keeps Williams' AX brand calves in demand.

Williams gives credit to a lot of folks for helping him work out his successful combination. With an open mind always looking for new or better ways, he serves in a number of state and local organizations.

Active in Community Affairs

As you might expect, he is vice-chairman of the Laramie Rivers Soil Conservation District. That fits well with the soil and water conservation he practices on his ranch.

Fortunately, Williams recognized long before the present drouth that his meadows must produce more hay to

These yearling steers on the Williams ranch are the kind of big rugged animals that can make the best use of well managed pasture.

Harlan N. Tulley is range conservationist, Soil Conservation Service, Sheridan, Wyoming.

balance his livestock operation and to provide a feed reserve for the "bad" years. So he obtained the help of Soil Conservation Service technicians in improving his system of meadow irrigation. A new dam stores water. And concrete turnout structures help use the water efficiently.

Renovation Gives More Hay

Next, came improvement of the grass hay stands. A pasture seeder was used to place fertilizer and new seed in furrows the seeder made through old sod. The result is more and better hay from the smooth bromegrass, intermediate wheatgrass, timothy and alsike clover. More and more of the ranch land is being handled according to a comprehensive land treatment plan.

The improved area supplements 23 pastures of native grass. Good management—which includes leaving some grass cover—keeps these pastures in good condition in spite of the moisture shortage.

Winter feeding is done near the hay meadows. Calves are dropped there, too. And if weather permits, meadows may be grazed lightly before moving the cattle into native grass pastures in the direction of Forest Service grazing land allotment. Four and a half to five months of grazing on native grass during the summer months keeps production costs to a minimum.

Fall brings the herd back to the headquarters pastures. Some calves are held back for replacement stock. Those for sale are cut out and the herd is shifted to new pastures until time for winter feeding again.

Rancher Williams aims for fast-gaining quality calves. He gets them with quality breeding and maintaining pastures in best possible condition.

The larger than usual number of pastures allows extra sorting of cattle. More important, the amount of grazing can be controlled by shifting cattle among the various pastures. Watering areas are distributed to assure even grazing with a minimum of attention.

The entire setup is aimed at conservation—wise use—of ranch resources. It's paying off in high production in spite of a drouth period.

Cows and calves on hay meadows give native range grass a chance to grow during early spring. Grass hay mixtures are improved by overseeding with a drill which places seed and fertilizer in narrow furrows in the sod.

Utilization of Swamplands for Wild Rice Production: A Progress Report

CHARLES H. STODDARD

Wild rice production may provide a profitable use of swamplands in parts of United States. Or at least, additional food for wild fowl. The author reports his experiences in establishing a stand of wild rice in what had been an unproductive swamp. Some of the things he found may be of help to others who have similar problems.

WILD RICE, a staple grain of the Indian tribes in the northern lakes country for centuries, is still found at scattered locations over much of the eastern United States. Commercial stands are present mainly in the lake districts of Wisconsin, Minnesota, Ontario, and Manitoba. Most of the present output in this country comes from northern Minnesota, where there are large shallow water areas and a favorable climate.

It is estimated that Minnesota has some 30,000 acres of natural wild rice beds. But only about half of these produce in commercial quantity. The annual harvested crop in Minnesota has been valued at a million dollars (1). Wisconsin is estimated to have only about 6,000 acres of rice habitat.

These northern states contain hundreds of thousands of acres of open swamps with flowing streams which were once forested with balsam fir, white cedar and other coniferous species. Logging, fires and finally beaver flowages have made these areas difficult, if not impossible, to reforest with present methods. Costs are prohibitive and losses are high. As a result these swamps have offered little promise of certain economic use.

One of the first writings which have been found proposing cultivation of wild rice was by Oliver Hudson Kelley. In his article (2) published in 1853 Kelley suggested "*. . . We must first ascertain if it can be cultivated and experience must then instruct us in what manner . . . There are thousands of acres in your state (Wisconsin) that may be sown with this crop to good advantage.*"

Storing Seed

He went on to offer members of the Wisconsin Agricultural Society seed for sowing and suggested that age may cause it to deteriorate—an observation in which he was entirely correct for wild rice seed must be stored under water or at cool temperatures.

Although Kelley did not suggest the possibility of flooding open swamps for wild rice farming, another observer did a year earlier. In the Wisconsin Agricultural Transactions for 1852, Joseph Bowron of Willow River, Wisconsin, in a published letter (3) to A. C. Ingham, Secretary of the Wisconsin Agricultural Society, fully described the whole harvesting process followed by the Indians and observed: "*I am now, and long have been of the opinion, that cultivation of it (wild rice) might be made very profitable, by having dams so as to flood the land at pleasure.*"

A whole century later these proposals for commercial production still had not been tried. Since World War II, the price of wild rice (*Zizania aquatica*) has advanced four or five times without bringing forth a corresponding increase in production.

For some years, wildlife managers and duck-hunting clubs have been planting wild rice seed in shallow water areas in an effort to raise more waterfowl food. Where the proper soil and water conditions existed, these seedings germinated and grew with fair success. Until comparatively recently, however, just what constituted "proper"

Sprague Lake and wild rice stands cover this area now. At the time of this photo in 1955, the area was unproductive swamp. Once it had been covered with timber. Then it was logged, burned and partly flooded with beaver flowages.

Charles H. Stoddard is forest economist for Resources for the Future, Inc., Washington, D. C.

soil and water conditions had not been defined, and there are still many unknown factors.

Work (4) by Moyle, Rogosin, Lawrence, and others of the Minnesota Committee on Wild Rice have established that the following conditions are present in the better wild rice lakes:

(1) Water slowly flowing through rice beds appears to be necessary in most cases, although rice has grown in lakes with neither inlets nor outlets.

(2) Water depths between six inches and four and one-half feet are commonly the range occurring in natural beds.

(3) Nearly constant or slightly declining water levels through the growing season are essential, since the buoyant rice stems and leaves will pull the roots out of the loose muck if levels rise.

(4) Water with a total alkalinity of 40 to 200 p.p.m. contains the best stands of rice.

(5) Soil hydrogen-ion concentration as nearly neutral as possible. (Author's note: Soils in two rice-lake beds reported in Table 1 had a $_{p}H$ 5.9 and 6.0, however.) Tests also showed high organic matter and low available phosphate and potash. Response to fertilizer is untested.)

(6) Water $_{p}H$ from 6.8 to 8.8 seems to support the best stands.

(7) Sulfate-ion concentration below 10.0 ppm is a condition for the best growth, although somewhat more is tolerated where dilution by surface runoff is frequent.

Some of the obstacles to greater production from natural stands are well known. The fact that wild rice ripens unevenly on the head necessitates several harvestings which, by law, must be done by hand in Minnesota and Wisconsin (to protect Indian livelihood and assure reseeding). Usually two or more pickings are needed. While recoverable yields per acre have been estimated to be a maximum of 450 pounds of green rice, actual recoveries are less than this. Natural enemies, particularly red-winged blackbirds (*Agelaius phoeniceus*), frequently strip whole stands in the "milk" stage. Heavy winds and hailstorms likewise can reduce yields.

Unfortunately, little experimental work has been undertaken on wild rice culture. Selection or breeding for uniform ripening is probably the most important single research need if economic harvesting is to be accomplished (5).

The writer owns land located in the town of Frog Creek in northeastern Washburn County, Wisconsin, which includes a 20-acre open swamp with a small flowing stream (Wolf Creek). It was felt that this creek could be dammed to make an artificial lake for wild rice cultivation.* A neck of land stretching out into a swamp provided a natural low-level dam site. Soil and water tests in the winter of 1954-55 indicated conditions similar to those in natural rice beds. Other requirements previously enumerated were satisfactorily present. (See Table 1.)

After dead timber was cleared away and trash was burned, part of swamp area was disked to prepare a seedbed for the wild rice.

Table 1. Results of Water and Soil Tests

Test	Wolf Creek	Optimum Range
Water[1]		
Total alkalinity	62.5	40-200 p.p.m.
Sulfate ion	9.5	under 10.0 p.p.m.
Hydrogen ion (pH)	7.2	6.8-8.8

Test	Wolf Creek Swamp	Mulligan Lake[3]
Soil[2]		
pH	5.9	6.0
Potassium	low	very low
Phosphorus	low	low
Organic matter	high	high

1. By Minnesota Department of Conservation.
2. By Soils Testing Laboratory, University of Minnesota.
3. A natural lake near the project; analyzed as a local check on the Wolf Creek Swamp data.

Construction of the earth fill dam was begun in the spring and a concrete spillway was completed in late August. Both tasks involved difficulties because hauling heavy supplies and equipment into the remote location had to be preceded by road construction. An emergency spillway was also provided to take care of sudden runoff from rainstorms in the growing season when damage from high water is greatest.

Heavy grass sod along with scattered brush covered the

**Invaluable assistance in the undertaking was given by the late John L. Sprague, a Minneapolis conservationist and outdoorsman without whose vision and encouragement the project would not have been possible. This artificial wild rice lake is named in his honor.*

muck soil found in the swamp. It was felt that poor germination of rice seed would result if the heavy accumulation of dry grass were not eliminated and the soil exposed. The heavy dead-grass layer was burned late in June taking care that fire did not spread to the uplands. This reduced all surface material to ashes and killed scattered shrubs. During a dry spell it was possible to disc the burned area. Flashboards were then set in the dam, and the area flooded to an average depth of about three feet.

Wind Reduced Yield

Seed was obtained from Indians at Leech Lake, Minnesota, where yields were abundant but seed size only average. It would have been more desirable to obtain a larger-grained strain, but the 1955 crop in many lakes had been seriously reduced in yield by high windstorms. The seed was stored under water until later in the fall when all other work on the project had been completed. The seed was broadcast from a boat with poles serving as guidelines to insure a uniform seeding.

The area was dammed and the soil prepared, flooded, and seeded at a cost of approximately $100 per acre. Use of a drop-inlet dam in lieu of the concrete structure would have resulted in considerable saving, but it was felt that more sensitive control of water levels would result with the latter. In an experimental area control of water levels is an important factor.

Good Germination Results

An excellent germination resulted in fair to dense stands of rice throughout the seeded area. Disking made little apparent difference in the ultimate stand. Until the middle of August, there seemed to be every prospect for an excellent yield. Heads began to form well, indicating successful pollination.

Discouraged Blackbirds

Blackbirds began to work over the beds in flocks that could not be entirely discouraged by shooting. Only after they had done considerable damage, the twisting, flashing metallic streamers (used to attract the eye to used-car lots and gasoline stations) were tried and found to repel the birds with considerable success.

By September it was apparent that yields had been reduced below levels for profitable harvesting and still supply seed both for the succeeding year's crop as well as for sowing in the unplanted areas of the previous year. As a result, only enough rice was harvested for seed purposes. No records were kept of the yields. Oddly enough 1955 rice yields in natural lakes in this part of Wisconsin were too low to warrant harvesting, while in Minnesota bumper crops were obtained. Observers have noted rather wide fluctuations from year to year in yields, but the causes are seldom clear. Wisconsin Conservation Department biologists reported the presence of the ergot fungus *(species unidentified)* in several rice lakes, but limited samples did not indicate its presence in the Wolf Creek stand. There is enough seed in the mud for next year's crop so that, if this man-made wild-rice field follows the usual pattern of natural lakes, more satisfactory yields can be expected in the future.

If the yield of green rice amounts to 300 pounds per acre at 30 cents per pound, the returns should justify the necessary investment. Cultivated areas of this sort are not subject to state laws prohibiting machine harvest so harvesting machinery may be used. Since such machinery

This photo shows the earthen dike and concrete spillway built across the swamp to create Sprague Lake in which the author established a stand of wild rice.

is available, its use could result in greater yields of wild rice.

Significance and Conclusions

In addition to the economic significance of the project both as a new form of land use and as a source of additional wild rice for market, there are several auxiliary benefits. Water conservation through storage and flow regulation may benefit downstream levels, since some summer drawdown is considered good management for maximum yields. The possibilities of minnow and furbearer production are yet to be determined, but utilization of these resources is planned. Several species of minnows were introduced and should reproduce in quantity during the next season or two. Three species of trout were stocked in the lake in the fall of 1955, since the inflowing stream maintains a temperature cold enough for their summer survival.

As a waterfowl area, it is ideal. Heavy grass shores, old beaver houses, and brushy flooded patches in the shallow upper end of the lake make excellent duck habitat. Two small islands were bulldozed from the lake bed for resting and nesting areas. Teal and mallards (*Anas discors* and *A. platyrhynchos*) produced broods, and a wood duck house has attracted occupants. A pair of wild geese (*Branta canadensis*) was observed resting on the lake in mid-May.

If this project proves to be economically sound, it may stimulate further marsh flooding. Drainage projects in the natural prairie wetlands of the Mississippi and Central Flyways are rapidly reducing waterfowl breeding habitat. Since the northern Lake States contain several hundreds of thousands of acres of open marshes and flowing streams, the project of combining wild rice, fur, and minnow production may prove to be a sufficient incentive to flood acreages and so offset the drainage taking place farther south and west.

The present experiment thus appears to offer some encouragement that flooding may prove to be economically attractive as well as ecologically and aesthetically desirable in this region. While the results reported here are quite preliminary in every way, the promise of this type of management clearly calls for replication of similar experiments by land-use agencies under a wider variety of ecologic and geographic conditions. Observations on ecologic changes would be an important part of such experimental areas and projects. Introductions of any exotic fishes should be done only after consultation with ecologists and the state conservation department.

Summary

In northwestern Wisconsin, a 20-acre area was dammed, burned, disked, flooded, and seeded to wild rice at a direct cost of approximately $100 per acre. The first-year yields of wild rice were considerably reduced by blackbirds, but the birds were finally repelled with metallic streamers. Waterfowl were attracted to the area, and management of exploitable fish and furbearer populations seems possible. Caution is urged in making any introductions, especially if exotic species are considered. As a land-use technique potentially capable of paying for itself over an important part of the Lake states, this experiment points to a possible way for utilization of large areas of swampland. Specific research needs are presented.

REFERENCES

1. "Million Dollar Wild Rice Crop." *Federal Reserve Bank of Minneapolis Monthly Review*. Vol. 12, No. 8, 2 pp. August 1955.
2. Kelley, Oliver H. "Wild Rice." *Transactions of Wisconsin State Agricultural Society*, pp. 264-266. December 1853.
3. Bowron, Joseph. "Wild Rice." *Transactions of Wisconsin State Agricultural Society*, pp. 286-288. December 1852.
4. Rogosin, Alfred. "An Ecological Life History of Wild Rice." University of Minnesota Department of Botany Research Report. Reproduced by Minnesota Department of Conservation Division of Game and Fish, 29 pp. mimeo. 1954.
5. Lawrence, D. B. "Wild Rice." *Minnesota Naturalist*. Vol. 2, No. 2, pp. 24-25. 1951.

This photo shows Sprague Lake flooded to an average depth of 36 inches in the spring before emergence of the wild rice plants.

This photo from a similar point shows successful germination and growth of wild rice. This was in July about a month prior to ripening.

THE CRISIS IN WORLD POPULATION. By J. O. Hertzler. *University of Nebraska Press, Lincoln, Nebraska. 279 pages. 1956. $5.00.*

"This book", as stated in the preface, "is the outgrowth of an interdisciplinary seminar on international relations, devoted specifically to Population in International Affairs." It was headed by the author and presented with the cooperation of colleagues from various departments of the University of Nebraska. Consequently, the book gives general emphasis to some of the main features of the world population growth in a social scientific manner for college students and interested laymen, many of whom are unaware of the gravity of the situation.

The author has given primary consideration to the more important underlying factors and processes involved in the world's phenomenal increase in population in recent centuries. Other points of interest give emphasis to the social and scientific principles relating to the changes, some of their effects, the resulting national and international problems and a review of proposals advanced to cope with the situation.

Two chapters are devoted to the so-called underdeveloped countries, constituting about two-thirds of the world's population, where conditions are serious. Other sections of the book cover excellent discussions on *Increasing the World's Food Supply, Migration as a Possible Solution of Population Pressure and World Fertility Reduction.*

Generally, the author is not highly optimistic as to an early solution of the many involved problems. He points out, for example, that "when there are five more persons in the world every four seconds, the finiteness of the earth becomes a matter of paramount concern regardless of man's ingenuity in utilizing its resources."

"Our World," the title of the first chapter in the book, clearly sets forth the total world-wide population situation. "It is a world in which each of us must admit with Zeno of the fourth century B.C., 'I am a citizen of the world.' " This thought prevails and the reader is brought close to the fact that the world has become finite. There are no new frontiers for expansion. The existing frontiers are "of a scientific-technological and a sociological-economic-political, rather than a geographical, nature." Another section of this chapter deals with world differences as they apply to wealth, raw materials, standard of living, customs, ideologies and social institutions.

The section titled "A World in Ferment" is disturbing. Here the author shows the great changes taking place as the result of western penetration. Changes have been brought about which, to a degree, disorganized the matrix of their culture and partly disillusioned the people. The last section sets forth eleven factors that involve population. These form the basis about which the book is written.

Conservationists and students concerned with resource use programs will find this book useful. It gives real substance to their chosen vocations. Resource leaders are challenged to speed up conservation programs everywhere to help meet the basic needs of a population that is increasing at the 1953 rate of 1.2 per cent each year. Actually at this rate of increase, it means that world population would be doubled in 58 years—from the present two and a half billion to five billion human beings.

SOIL CONSERVATION. By J. H. Stallings. *Prentice-Hall, 70 Fifth Avenue, New York, N. Y.*

Thoroughness is perhaps the best single word to describe this book of nearly 600 pages. Its purpose as stated in the foreword is "to document the efforts and accomplishments of the soil and water conservation movement during the past two decades." Anyone familiar with the expanding literature relating to the care and use of our soil and water resources will recognize at once that within these pages one will find the most complete account and documentation of pertinent research findings yet available.

This should not be surprising for one of the major tasks assigned the author while employed by the Soil Conservation Service as research specialist for eight years, was to assemble, analyze and interpret all available data bearing on soil and water conservation.

Part I deals with the historical phases of soil erosion; Part II with the fundamental problems. Part III lists and describes conservation practices, and Part IV deals with the planning phases of the program.

The social consequences of misuse of land and water is included in the book, but it is not given as much emphasis as many ardent conservationists would like to see. Perhaps more emphasis is not called for since this aspect is adequately outlined in many other texts. Also, this reviewer found little that reveals the farmer's attitude or thinking toward the care and use of the land or how present day farmers are exercising leadership in attacking the problem through soil conservation districts.

However, this book will commend itself immediately

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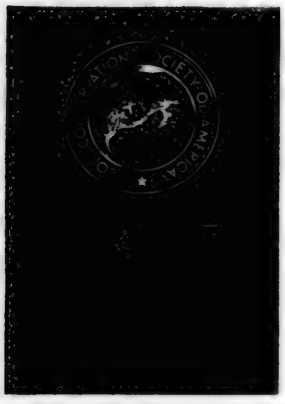

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for use as a college text. Most certainly every research worker whose duties relate to finding better ways to conserve our basic soil and water resources will find it to be decidedly helpful.

—GLENN K. RULE, *Chevy Chase, Maryland*

MAN'S NATURE AND NATURE'S MAN. BY LEE R. DICE. *University of Michigan Press, Ann Arbor. 329 pages. 1955. $5.00.*

Human ecology of late has become a fashionable subject. What could be more challenging to all of us, and to conservationists in particular, than the relationship of man to his environment?

Lee R. Dice, professor of zoology at the University of Michigan, covers this whole intriguing field in *Man's Nature and Nature's Man.*

The title idicates the author's view of man as a part of nature, and of the two-way interactions of each upon the other. The approach is in harmony with the biogeographical ideas in Dice's earlier books, *Biotic Provinces of North America* and *Natural Communities.*

This book goes beyond biogeography. It embraces anthropology, sociology, and and even philosophy. This, I think, is its weakness. It attempts to put everything into one package. The cursory and summary treatment of important subjects that necessarily results robs the discourse of emphasis. To the author's credit is the thorough and objective manner in which the material is presented and documented.

Following a chapter on the "Essentials of Human Existence," Dice discusses man as a part of *communities*—"aggregation(s) of ecologically related individuals belonging to two or more species"; *societies*—"aggregation(s) of individuals belonging to a single species who are cooperating directly or indirectly with one another"; and *ecosystems*—"aggregation(s) of associated species of plants and animals, together with the physical features of their habitat".

The sketchy treatment of man's effect on his environment and the reciprocal effects on human affairs adds little to our understanding of conservation problems. In the chapter on "Deterioration of Human Communities" appear such statements as: "Soil fertility is an important natural resource where loss may have contributed to the cultural decline of certain communities," and "The decline of many ancient civilizations is ascribed by H. H. Bennett in considerable part to soil erosion."

The attempt to apply certain principles of ecology to mankind is always convincing. For example, the idea of a "cultural climax" is defined as "the limit to which the culture of a human population of given heredity may evolve in response to the physical and biotic conditions and to the natural resources of a particular area." But so many exceptions are cited that the reader is left doubting the validity of the concept.

Likewise, the attempt to classify human ecosystems ends with the conclusion that "The result is that only a part of the communities in any given area will fit any proposed system."

One of the virtues of the book is its refusal to state what the evidence at hand does not prove. Rather, it reviews with painstaking fairness recent findings and conclusions in all phases of the complex subject. And the reader can trace every item to its source in the excellent list of references. The result is an unexcelled survey of the literature which should prove a useful introduction to the study of man in relation to nature.

BEN OSBORN, *Washington, D. C.*

Resources For the Future, Inc., *Annual Report—1956. 1145 Nineteenth Street, N. W., Washington, D. C. 85 pages, illus. 1956.*

Resources For the Future, Incorporated, was established in 1952 with the cooperation of The Ford Foundation. "Its purpose," as stated in the report, "is to advance the development, conservation and use of natural resources, primarily in the United States, through programs

of research and education." Some of its programs are carried on by the central staff while others are supported by grants to other non-profit institutions.

The 1956 Annual Report briefly outlines the areas in which work is being done. These include: Water Resource, Energy and Minerals, Land Use and Management, Regional Studies, Resources and National Growth, Education, and Special Studies and Projects. A review of each area reveals the type of research underway and the current status of each project. It should be noted that the many projects listed are timely and in keeping with the needs of the nation's expanding economy. This is especially true of the areas concerned with water and resources education. A number of the studies have been completed and are ready for publication. Others will require additional time for completion.

Resources For the Future made 27 grants, including research agreements, in 1956 to recognized individuals, institutions and universities. These totaled over a quarter million dollars. Work covered under these grants is broad in scope and is usually local or regional in character.

Resource persons concerned with problems that have not been explored will find Resources For the Future alert to changing conditions and well equipped to handle any assignment within the framework of its charter. The 1956 report is not only progressive but timely.

Tractors for Logging. FAO FORESTRY DEVELOPMENT PAPER NO. 1. *International Documents Service, Columbia University Press, 2690 Broadway, New York. 189 pages, illustrated. 1956. $2.00.*

In the first part of this study will be found criteria determining the choice of a tractor, classified in logical order. This is followed in part two with the method of calculating the output of hauling equipment and finally in part three a discussion of unit costs.

This report includes sufficient detail to enable loggers to select suitable tractors. The discussions are clear and include formulas for making calculations under a variety of conditions.

Maryland Wildlife. *Wildlife Series Book No. 1. Maryland Game and Inland Fish Commission, 516 Munsey Building, Baltimore 2, Maryland. 80 pages, illustrated. 1956.*

This 80-page illustrated book is the first of a series dealing with the more important birds, mammals and fish found in Maryland. It was compiled by the Public Relations Division of the Maryland Game and Inland Fish Commission.

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The material in the book features 75 species of wildlife—each giving emphasis to range, description, breeding, habits and management. It is exceptionally well done and should serve a useful purpose in the schools of Maryland for which it was prepared.

Policies and Design Criteria for Inter-Related Highway and Agricultural Drainage, Erosion Control and Other Conservation Purposes. *(Tentative ASAE, Preliminary Copy, subject to change.) American Society of Agricultural Engineers, St. Joseph, Michigaan. $1.00.*

This preliminary publication is a step toward the development of an acceptable and usable standard or recommendation for the guidance of all who work with these problems. After it has been proven in use, with revisions and improvements developed through further experience, the American Society of Agricultural Engineers hopes it may meet the requirement and be adopted as an official recommendation of that Society. At present it is a committee recommendation.

Field Notes

World Conservation Exposition and Plowing Contests in Ohio

The 1957 World's Conservation Exposition and Plowing Contests will be held in Adams County, Ohio, September 17, 18, 19, and 20. The '57 event marks the fifth world's plowing competition and the first time it has ever been held on American soil.

Previous world contests were held in Canada, Ireland, Sweden, and England. Future contests are scheduled for Germany, North Ireland, France and the Netherlands.

The '57 event combines for the first time a World's Conservation Exposition, World's Plowing Contest, National and State Plowing Contests, State and National Youth Day, Women's Programs, Farm and Home Demonstrations and a complete commercial products exhibition. The exposition will focus the attention of the entire world on the importance of making the fullest use of natural resources through proper land and livestock management.

Plowing contestants from 15 countries will be competing for world wide honors. Representing the United States will be Lawrence Goettemoeller, owner and operator of a 230-acre farm in Mercer County, Ohio, and John Daniels, operator of a 555-acre farm near Mulberry Grove, Illinois. Goettemoeller and Daniels earned the right to represent the United States by winning the level land and contour championships in the 1956 National Plowing Contests in Jasper County, Iowa.

In addition to the plowing competition, exposition visitors will see the ultimate in soil and water conservation measures applied to the 2,500-acre site, including 16 different farms, located just north of Peebles, Ohio. Choice of the site was the responsibility of a committee from the National Association of Soil Conservation Districts.

General chairman of the event is Earl K. DeVore, dairy farmer and chairman of the Adams County Soil Conservation District.

Following is the schedule of events:

September 17—Youth Day and Ohio level land and contour plowing matches.

September 18—National plowing contests, level and contour.

September 19-20—World Plowing Contests.

September 21—Rain date.

Wagon tours will be in continuous operation during the entire exposition giving visitors a chance to observe conservation, forestry, wildlife, engineering, watershed development, livestock management demonstrations, and educational and commercial exhibits.

Many additional special events are on schedule. Just about every organization in Ohio and surrounding states has offered its assistance and is cooperating with the event.

Land Forming Booklet Available

Telling the story of "land forming" is a 19-page booklet being distributed by the Caterpillar Tractor Co., Peoria, Illinois. Presented in the manner of a textbook, the booklet, "Land Forming, A New Profit For You," outlines advantages of removing uneven soil conditions which move water off a field too fast or trap the water to cause crop drowning.

Record Timber Harvest

A new high of almost seven billion board feet of timber was harvested from national forests during the year end-

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Journal of Soil and Water Conservation

BACK ISSUES AVAILABLE

Volume	*Year*	*Numbers*	*Price per Volume*	*Price Per Copy*
I	1946	1, 2	$1.75	$ .90
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IV	1949	1, 2, 3, 4	3.00	.75
V*	1950	3, 4	1.50	.75
VI	1951	1, 2, 3, 4	3.00	.75
VII	1952	1, 2, 3, 4, 5	3.00	.75
VIII**	1953	1, 3, 4, 5, 6	3.00	.75
IX***	1954	1, 2, 3, 4, 5	3.00	.75
X	1955	1, 2, 3, 4, 5, 6	5.00	.85
XI	1956	1, 2, 3, 4, 5, 6	5.00	.85

*Vol. V, No. 1 and 2 out of print.
**Vol. VIII, No. 2 out of print.
***Vol. IX, No. 6 out of print.

The Soil Conservation Society of America will pay $1.00 an issue for numbers *out of print* if in good condition.

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ing June 30, 1956, to meet home and expanding industrial needs, according to the U. S. Department of Agriculture.

Forest Service field offices reported a cut of 6,907,041,000 board feet of timber between July 1, 1955, and June 30, 1956. This compares to the 6,328,229,000 board feet cut July 1, 1954, to June 30, 1955, the previous record year.

During the past few years the demand for national forest timber has risen substantially. The cut, however, is not yet up to the total that can be harvested annually under sustained yield management.

Increased Christmas Tree Market

A recent Forest Service survey showed that farmers own about 70 percent of the 255,000 acres planted exclusively to Christmas trees. In 1947, only 100,000 acres were planted and only 66 percent of that belonged to farmers.

In 1955, more than 37 million Christmas trees were used. That compares with 28 million in 1947. Of those used in 1957, over 25 million came from the United States —mostly from states along the Canadian border. The remaining 12 million came from Canada.

Dr. Charles H. Kline has been appointed Scientific Director for Shulton, Inc. He was formerly Manager of the Chemical Development Division, Climax Molybdenum Co.

★ ★ ★

Program Note

Keynote Speaker Selected For 1957 Annual Meeting

H. C. Fletcher, chairman of annual meeting program committee, has just announced, as the JOURNAL went to press, that Representative Clair Engle of California will be the *Society's* keynote speaker. His subject at the national convention will be *"Water—The Nation's Concern Today—A Problem Tomorrow."*

Others who have been scheduled to appear include: C. E. Busby, Soil Conservation Service; O. J. Kelley, Agricultural Research Service; Harvey Banks, Director of Water Resources for the State of California.

The July JOURNAL will carry a complete convention program. A copy will be mailed to all members of the Soil Conservation Society of America.

Letters

from our Readers . . .

Dear Wayne:

Check for $5.00 dues enclosed.

Compliments on circular by new President Russell and statement of goals. They should inspire confidence and make the brethren feel they belong to a dynamic organization that is worth supporting.

Chester S. Wilson

Dear Mr. Pritchard:

We wish to thank you for sending us the applications and descriptive literature relative to the philosophy and objectives of the Soil Conservation Society.

We have completed an application blank and we are distributing the other blanks to members of our organization who are interested in the objectives of the Society. We anticipate that a number of TVA people will become members.

It seems to us that many of our people could make a contribution to the Society. Should you desire their participation in future programs or meetings, you can count on their cooperation.

We will watch for material that might be useful in the JOURNAL OF SOIL AND WATER CONSERVATION.

Albert S. Fry
Tennessee Valley Authority

Dear Wayne:

Thanks very much for sending me copies of the papers delivered at the Annual Meeting in Tulsa. I have already read most of them, finding them very informative—excellent source material.

You also sent me the collection of articles reprinted in single pamphlet form under the heading "Our Watershed Resource." This, too, is very good reference material in a convenient form. I have already started to circulate it to see if industrial and business interests might not consider ordering copies in bulk.

I do have one comment in this regard: Even though the collection deals quite thoroughly with the agricultural aspects of watershed work, it does not cover many of the industrial and municipal aspects that we find so important in densely populated areas. In such areas all aspects—even though agricultural, forest and recreational lands are highly important—need more consideration in watershed planning and action. Perhaps the SCSA could make a real contribution to this problem through the establishment of a special committee to work with urban planning groups in this regard.

As we move farther into the watershed approach to the conservation and wise use of natural resources, we must face the need for integrated interests of rural and urban groups in well-rounded watershed development.

I'll write you again regarding the reaction I get to the reprint collection.

Lloyd E. Partain
The Curtis Publishing Company

Dear Mr. Pritchard:

I would like to report that partly as a result of having attended the annual meeting of the S.C.S.A. and because of information I was able to gather there, we have now formed a Watershed Committee in Manitoba. This is the first attempt at such a project which has been made in Western Canada. The committee is now set up on its own and while I am doing the secretarial work for it, I feel that they are progressing on their own initiative.

Many had felt the need for such a project, but not having information on it or knowing the over-all picture of the whole watershed, no one seemed in a position to assume the leadership. While we will not keep the exact pattern which you have in the States, the principle of co-operation and coordination will be the same. And through this set-up I am looking forward to considerable help from our federal government. This has certainly not been forthcoming in the past, mainly I feel because the municipalities have been trying to deal individually and in varying ways with the problem of surplus and run-off waters.

I am pleased to be able to submit membership fees on behalf of two other Agricultural Representatives in the province. Reg Forbes is located at Brandon and also has the duties as principal of the Agricultural and Homemaking School there. Glenn Arnott is serving the district at Boissevain, where I was previous to coming to Neepawa. Both of these men, I feel, are doing a good job in soil conservation, Reg Forbes having started the Save the Soil Clubs idea here in Manitoba. Our Save the Soil Clubs are quite similar to the Soil Conservation Districts. I am indeed pleased to recommend these two. I am also enclosing my own membership fee for 1957.

Department of Agriculture
and Immigration
Wallace O. Lee

Dear Mr. Pritchard:

Thanks very much for your letter of December 5 enclosing my Honorary Membership card in the Soil Conservation Society of America. I certainly wish the Society well.

I had strong hopes that the new Soil Bank program would give the soil conservation program a real boost and enable them to do something real in the way of retiring some of the poorer land from cultivation and putting it into forest or wildlife plantings. However, the reactions we are getting in the office to date from the various states is that relatively few state committees are recognizing the opportunity to help forestry and wildlife. The regulations may not be well enough known to them, and the regulations in some cases seem to be somewhat ambiguous. I hope that this will shake down and that a real program of the soil bank can be put into effect.

Ira N. Gabrielson, President
Wildlife Management Institute

Dear Mr. Pritchard:

I have received your letter, with enclosed Honorary Membership card for 1957. I greatly appreciate the honor which was extended to me by your Society in naming me an Honorary Member, and I, too, regret that it was impossible for me to be present to accept the award.

I have also received the JOURNAL OF SOIL AND WATER CONSERVATION, and read the article on awards, as well as all of the magazine, with much interest.

Assuring you of my continuing interest and efforts in behalf of our soil conservation programs, and thanking you again, I am sincerely yours.

Jamie L. Whitten
United States House
of Representatives

Dear Wayne:

Thanks for your good letter of December 5 in which you enclosed my membership card.

I am grateful for your expression of regard for my physical welfare. Yes, as you heard, I spent two months in the hospital with a broken hip. It resulted from an auto collision as I was returning from the Watershed Conference at Lincoln, Nebraska, in September.

It will be a pleasure to help the Society and its program if I can. Please feel free to call upon me if there is anything I can do to help.

I hope to attend our National Association of Soil Conservation Districts meeting in St. Louis in February. Perhaps I'll see you there.

Joe B. Douthit, Director
The National Association of Soil
Conservation Districts

Gentlemen:

You will find my check for $5.00 to cover my 1957 membership dues in SCSA. Have been a member for nearly ten years and feel that it has benefited me greatly. The Journal is worth more than the $5.00 each issue.

Edgar L. Wight
Brigham City, Utah

Dear Wayne:

From every side now the Bible land is being farmed on the contour. Now no loan will be made by the government for plantations—orchards or vineyards unless the plantings are laid out on the contour.

Next July my assignment to Israel comes to an end and we are going home—to take no more long asignments—I'm all for the World Soil Conservation Society and have written Professor McConkey to this effect—with some ideas that have been in the making for some time.

Sorry I had to miss the annual meeting.

Yours for conservation of the Good Earth.

Dr. W. C. Lowdermilk
Haifa Technion
Haifa, Israel

News Notes

PRESIDENT'S COLUMN

We were bemoaning the fact that the soil bank hadn't turned out better in getting a good land use program into operation in these United States.

It was at breakfast with a man who formerly had held a high position in the U. S. Department of Agriculture, and who, like some of the rest of us, had expected big things from a land use program.

We had thought that the soil bank would help get the job done, but so far results have been disappointing.

J. S. Russell

The acreage reserve portion has been one of crop adjustment rather than for genuine land use. The conservation reserve has possibilities—we still can put it to good use in getting some low capability land back into grass or trees where it belongs.

The soil bank is only one of the many tools available to us to get better land use. It happens to have been the most recent one but we have many others. Sometimes it seems that we have so many ways to get the job done that confusion results—or at least some folks are all mixed up about conservation, surpluses, subsidies, and the like.

Perhaps we haven't done too good a job of getting across to the public some of the "facts of life" regarding our need to (1) conserve soil and water, (2) put each acre to its best use, and (3) give a thought to the need for recreation and wildlife in our management of our natural resources.

Some folks ask why it is that we are seeking to conserve the soil when we already are raising too much and have on hand considerable surpluses of wheat, cotton, corn and dairy products.

The answer is fairly obvious to most folks close to the land and to conservation. They realize that, with our growing population, tomorrow's needs may be greater than today's production. It is only reasonable then to protect the resources we have, use wisely the acres in production now and be ready for future increases in crops, if and as needed.

But just how does all this affect a *Society* like ours?

Most of our members are busily engaged professionally in some activity in the field of conservation—soils, land use, forestry, wildlife, or others.

That in itself means that the various individuals are working toward the ends and objectives of our *Society*.

But it is in the co-ordination and the teamwork that we have a tremendous opportunity and responsibility.

Visits with *Society* and chapter members in several states recently are enough to convince a person of the value of the association together of representatives of various agencies. That's where chapter activities come in. It does take teamwork to get done this job of conservation.

It takes also education. We need to make it clear that there is a difference between SCS, ACP, soil bank, and other agencies and programs. Some folks don't even know what a soil conservation district is and what its functions really are. We need to explain that conservation isn't to be confused with subsidies. And that wise use of the land can help check further buildup in current surpluses even though that is not the primary objective of soil and water conservation. We need to make it clear to many landowners that conservation *pays* rather than *costs*.

If we are to live up to the philosophy and objectives of this society and to "advance the science and art of good land use," it seems to me that it requires (1) contribution by individuals over and above the call of duty and (2) everlasting team work.

I know of no group more devoted to doing their job—and more too—than the men engaged in the various aspects of conservation and land use. I firmly believe that we in the Soil Conservation Society of America can help each other do a better job through working together in our organization.

J. S. Russell, *President*.

Six States Exceed Membership Quota

More than 1,000 people joined the *Soil Conservation Society of America* during the first four months of 1957. The states of Georgia, Indiana, North Carolina, North Dakota, Washington, and Wyoming have exceeded the quotas established for them by the national membership committee.

States leading in total membership gain for the period include: North Carolina (74), North Dakota (70), Mississippi (53), Washington (53), Iowa (49), Indiana (48), Georgia (47), South Dakota (43), Michigan (43), California (42), Kansas (41), Oklahoma (37), and Wyoming (36).

The 12 states accounted for 636 new members or 61 per cent of the total. In addition 93 foreign members joined the *Society* during the period and this accounted for nine per cent of the gain.

The membership quotas established for the various states and the standings as of May 1, 1957 is as folows:

	1957 Quota	*Enrolled to May 1, 1957*	*Over or Under Quota*
Alabama	30	12	—18
Arizona	25	2	—23
Arkansas	100	5	—95
California	100	42	—58
Colorado	50	6	—44
Connecticut	10	5	— 5
Delaware	10	2	— 8
Florida	50	7	—43
Georgia	25	47	+22
Idaho	40	4	—36
Illinois	60	14	—46
Indiana	25	48	+23
Iowa	70	49	—21
Kansas	50	41	— 9
Kentucky	60	15	—45
Louisiana	25	7	—18
Maine	10	0	—10
Maryland	50	12	—38
Massachusetts	10	5	— 5
Michigan	70	43	—27
Minnesota	40	21	—19
Mississippi	60	53	— 7
Missouri	40	5	—35
Montana	25	3	—22
Nebraska	50	20	—30
Nevada	10	2	— 8
New Hampshire	10	0	—10
New Jersey	30	11	—19
New Mexico	25	4	—21
New York	50	3	—47
North Carolina	70	74	+ 4
North Dakota	50	70	+20
Ohio	50	18	—32
Oklahoma	80	37	—43
Oregon	20	3	—17
Pennsylvania	30	9	—21
Rhode Island	10	2	— 8
South Carolina	50	15	—35
South Dakota	70	43	—27
Tennessee	50	14	—36
Texas	50	7	—43
Utah	20	4	—16
Vermont	10	3	— 7
Virginia	25	16	— 9
Washington	30	53	+23
West Virginia	50	13	—37
Wisconsin	50	13	—37
Wyoming	10	36	+26
Puerto Rico	10	1	— 9
Washington, D. C.	30	4	—26
Canada	30	6	—24
Foreign	100	87	—13
Misc.	85	26	—59
Total	2,200	1,043	

Chapter Awards Announced

The Awards Committee of the *Soil Conservation Society of America* has established a program to recognize the work of chapters.

The awards will be based on the most outstanding single project of a chapter. No special form or entry blank is required. The project may have been carried out by a member of the chapter but some evidence should be presented that it was chapter sponsored.

It is suggested that a narrative report of the project should be submitted to the regional representative designated to handle the contest. Awards will consist of a

high chapter rating with resulting publicity for the effort. The purpose is to compile a summary of outstanding chapter projects, thus to enable the total *Society* to do a better job.

Entries from the various regions should be mailed as follows:

Northeast—WALTER C. GUMBEL, *P. O. Box 1392, Fairmont, West Virginia*

Southeast—A. H. VEAZEY, *P. O. Box 5126, Raleigh, North Carolina*

North Central—E. L. SAUER, *Univ. of Ill., Urbana, Ill.*

Great Plains—H. G. BOBST, *Rm. 604, 134 S. 12th St., Lincoln, Nebr.*

Western—FLOYD O. TUMELSON, *135 Encinal Drive, Red Bluff, Calif.*

Society Members Promoted

Thomas P. Helseth, formerly Deputy State Conservationist for the Soil Conservation Service in Idaho, has been appointed State Conservationist in Oregon. **Harold E. Tower**, who held the Oregon position, is now Western Field Representative for that agency. Tower succeeds **Cyril Luker** (*Society* Member No. 1) who has been appointed Special Assistant to Administrator in Charge of Great Plains Program.

Herschell D. Hurd succeeds **Truman C. Anderson** as State Conservationist for the Soil Conservation Service in Montana.

Benjamin Isgur follows **Arthur B. Beaumont** as State Conservationist in Massachusetts. Anderson and Dr. Beaumont have retired.

Empire State Chapter Elects Officers

Officials of the Empire State Chapter gathered for their picture at recent meeting in Ithaca, New York. Left to right: M. W. Weaver, new chairman; Rodman Fellows, retiring chairman; Mrs. Iva Van Pelt, first woman secretary of chapter; Harlan B. Brumsted, vice chairman. Cornell University Photo.

Harlan H. Backhaus, formerly Area Conservationist for the Soil Conservation Service, has been appointed Assistant State Conservationist in Iowa replacing **V. W. Silkett.** Silkett has been appointed Chief of the Farm and Ranch Planning Branch, Soil Conservation Service, Washington, D. C. **A. M. Hedge**, who formerly held

How to be a Successful Conventioneer . . .

To get the most value from attendance at the national convention you should prepare in advance as you do for your monthly work. Attendance at a convention can be a great inspiration or it can be a disappointment. There is no sure way of knowing in advance the benefit to be derived from such a meeting. This year more than nine million persons will attend 20,000 association meetings in hotels and millions more will meet at public and private institutions. This does not include company meetings.

Your *Society* will meet for the 12th time at Asilomar Beach State Park, Pacific Grove, California, August 28-31, 1957. Committees for local arrangements to add to your enjoyment have been hard at work for months. The program committee has devoted hours of time searching for the material to be presented as well as the individual most capable of discussing the various topics.

When the convention is over—if it runs true to form—there will be those who return home burning with enthusiasm to do a better job in conservation and who will immediately make plans to go to Asheville, North Carolina in 1958. Then there are those who will be disappointed—regardless of the quality of the program or the arrangements made by others.

Frankly, it is not the program or local arrangements committee that can make the meeting a success. It is the Society member who plans his attendance and activities that will be most satisfied. In other words much of the responsibility for a successful meeting depends on the delegate and how he enters the "swing" of the meeting.

Following are some suggestions for your attendance at the *Society's* meeting:

1.

Plan your participation in the meeting from the moment you decide to attend.

2.

Avoid disappointment; make your reservations far in advance for travel and room accommodations. Our convention will be at the height of tourist season and making reservations in advance will save you time and money.

3.

Write to men from distant places—men you hope to sit down with during off hours at the meeting—and make appointments to get together.

4.

Check over personalities appearing on the program. Are there any whose experiences will be valuable to you? Make certain to attend their sessions and, if necessary for additional information, see them afterward.

5.

Jot down specific problems that now confront you in your conservation work. Plan to find men at the convention who can discuss them and help find a solution.

6.

When you get to the convention, check the list of delegates to make sure you do not miss an opportunity to visit with distant friends.

7.

Capitalize on meal-time hours. Arrange to eat with different groups of friends each meal. The American plan this year—meals included with price of hotel accommodations—encourages group dining and avoids embarrassment and expense of getting stuck with excessive meal checks.

8.

Make a point to see and be seen by all engaged in work similar to yours. Swap a story or experience with them. Let them realize you exist. Let them know of your special experience and work.

9.

Plan to spend at least some time with old friends and new in an old-fashioned bull session. Many a tip, more valuable than any in the best planned program, is dug out of just such informal talk.

10.

Keep a list of new acquaintances made at the convention. Write them when you get home and keep in touch between sessions.

11.

Know your limitations but remember the old adage "All work and no play makes Jack a dull boy." Study the recreation opportunities offered this year and plan to interrupt your hard work at the convention with some good hard play. Many of those who get the most out of a convention also make the most of recreation opportunities offered.

that position, is now with the Department of State on an assignment in New Delhi, India.

William F. Warren, Work Unit Conservationist, Soil Conservation Service, West Springfield, Massachusetts, has resigned to enter work with a private firm interested in soil conservation work.

Hobart Sockman, Area Conservationist, at Defiance, Ohio, has recently transferred to Harrisburg, Pennsylvania, where he is Soil Conservationist on the state staff.

Glenn Morris has been appointed Area Conservationist for the Soil Conservation Service at Elyria, Ohio. **C. G. Phillips,** Area Conservationist at Warren, Ohio, has assumed a position as Soil Conservationist on the state staff at Columbus in that state. **James Bennett** will succeed Phillips.

Sam W. Bondurant, State Conservationist for the Soil Conservation Service in Virginia, has retired and is now a field representative for the state soil conservation committee in the same state.

Mission Churches

Among the many points of historic interest in California are the 21 missions founded by Franciscan Fathers between 1769 and 1823. The second mission—San Carlos Borromeo de Carmello—is located on Monterrey Peninsula and near the location of the *Society's* Twelfth Annual Meeting. Founded by Father Junipero Serra in 1769-70, the mission later moved to a church built in 1797. The great stone church is noted for the Moorish influence of its tower dome as well as for the Gothic arch of its roof. Additional information about California Missions may be secured from The Fidelis Publishing Company, 6665 Sunset Blvd., Hollywood 28, California.

Entrance to the great Stone Church, Mission San Carlos Borromero de Carmello, built in 1797.

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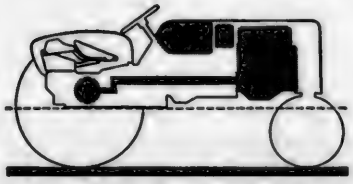

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Here's What to See in California . . .

. . . when you go to the 1957 annual meeting of the Soil Conservation Society of America

Those attending the *Society's* Twelfth Annual Meeting will have the opportunity to visit many points of special interest in California. Waldo E. Wood and others on the local arrangements committee have prepared the accompanying map to assist *Society* members in planning their California itinerary.

Special points of interest are indicated below and may be found on the map.

San Francisco Bay Area—Golden Gate Bridge, China Town, cable cars, Golden Gate Park, fine museums, Planetarium, Steinhart Aquarium, Maritime Museum, Fisherman's Wharf, fine restaurants and shops. Oakland-Bay Bridge to East Bay cities of Berkeley and Oakland.

El Camino Real—The route of the Franciscan Mission Fathers, 23 missions from San Diego to Sonoma.

Sonoma and Napa Valley Vineyards and Wineries—Convention time (Aug-

ust-September) is harvest time in the vineyard country. The wineries are crushing the grapes and carrying on the processes of fine wine making. These two valleys are world famous for their fine wines. Many of the wineries welcome visitors.

Sacramento—Sutters Fort—The State Capitol with beautiful grounds containing trees from every country in the world. Sutter's Fort, reconstructed just as it was built in the early '40s as the heart of Sutter's Golden Empire. An outstanding historical museum.

Mother Lode Country—Sonora to Nevada City. The foothill road along the Sierra Nevadas with the old mining ghost towns full of California's Gold Rush mining lore.

a. Columbia—Preserved as a State Park as one of the most representative early day mining towns.
b. Coloma—Sight of the discovery of gold which brought the "Miners-49ers" to California to seek their fortunes.

Yosemite Valley—One of the most majestic national parks in the United States and a "must" on the list of out-of-state visitors.

Calaveras Big Trees—A magnificient stand of Sequoia Gigantea trees preserved for all time as a state park.

Santa Barbara—Fabulous Santa Barbara, beautiful homes and fine gardens. There is most always a fiesta in Santa Barbara!

Sequoia and King's Canyon National Park—Giant Forest. One of the state's most scenic trips. Enormous stands of redwoods and breath-taking expanses of rugged King's Canyon Wilderness area. General Sherman tree—the largest redwood tree in the world.

Redwood Highway—Miles of fine highway through the mighty redwoods. Founders Tree—tallest in the world.

a. Eureka—Busy metropolis of the coast redwood lumber industry and north coast commercial fishing.

Los Angeles, Hollywood, Motion Picture Studios, Disneyland.

Muir Woods—Closest redwoods to the Bay Area. A fine stand of Sequois Sempervirens set aside as a National Monument. Park naturalist will conduct parties through the area if desired.

Shasta Dam and Shasta Lake—Where headquarters of the Sacramento River are impounded in California's largest manmade lake, storing 4,500,000 acres feet of water for irrigation, power, recreation, flood control, and navigation.

Chapter News

Northern Illinois

The Northern Illinois Chapter met at Illinois Wesleyan University, Bloomington, Illinois, on November 16. Talks given included: "Principles of Water Rights" by J. A. Johnson, Soil Conservation Service, Spartanburg, South Carolina; "Water Resources of Illinois" by William C. Ackermann, Chief State Water Survey Division, Urbana, Illinois; "The Soil Conservation Score in Illinois" by B. B. Clark, State Conservationist, Soil Conservation Service, Champaign, Illinois; "Coordination of Water Development Projects Between the

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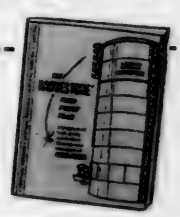


Name.....

Town.....R.F.D.....

County.....State.....

Corps of Engineers, U. S. Department of Agriculture, and the State of Illinois" by Col. J. B. W. Corey, Jr., U. S. Army Corps of Engineers, Chicago, Illinois; "The Human Element in Natural Resources Conservation", J. S. Russell, Farm Editor, Register and Tribune, Des Moines, Iowa, and president of the *Society* for 1957.

Southern New England

The annual winter meeting was held at Berlin, Conn., on January 24, 1957. Gregory G. Curtis, program chairman, introduced the following program:

"Trials with Plant Materials"—Arthur B. Beaumont, state conservationist, Soil Conservation Service, Mass.

"Vegetative Cover on Highway Slopes"—William C. Greene, landscape engineer, and Edward C. Button, agronomist, State Highway Department of Connecticut.

"Connecticut Valley's Big Question Mark"—Elmer R. Foster, Connecticut River Watershed Council, Greenfield, Mass.

"A Military Reservist Observes Conservation"—Matthew A. Puchalski, soil scientist, Soil Conservation Service, Windsor, Conn.

"Results of Top Soil Removal Plots at the University of Massachusetts"—Karol J. Kucinski, Department of Agronomy, University of Massachusetts.

"Industry Looks at Class A Land"—Charles N. Hammerlund, Jr., industrial agent, Connecticut Development Commission.

The group was welcomed by Walter Ackerman, farm service director, Connecticut Light and Power Company. The same company provided the meeting facilities.

SCSA Convention Information

This year the *Society's* convention is earlier than usual and during the peak of the tourist season. It is most important that your reservation be made early.

The convention will start on August 28, 1957, but you will not be able to register prior to 3:00 p.m. on that date. If you arrive a day early make certain that you have made arrangements elsewhere for that day.

Convention accommodations this year are seven "Long Houses" with fifteen twin bedrooms opening off a central corridor with community lavatories provided separately for men and women.

In addition other housing is known as the "hotel type" with either private or connecting baths.

The rates are as follows:

	Single	Two per room	Child 11 and under
Long House	—	*$18.00*	*$13.50*
Hotel	*$28.50*	*25.50*	*15.50*

For infants under two years of age, the only charge is $1.00 per day for use of a crib.

Convention registration fee and other special events are extra but it is thought they can be kept under $5.00. No registration fee for wives or children will be made.

The charge for the convention is for room and meals—the American plan will prevail as does a flat rate for the entire meeting. Individuals staying outside the conference grounds must pay a $1.50 grounds fee for the meeting.

More complete information has been mailed all *Society* members but if you have lost the reservation card you may use the form on this page to complete your reservation. Send it to *Soil Conservation Society of America*, Reservations Committee, P. O. Box 537, Pacific Grove, California.

The July issue will carry more information about the annual meeting program. If you have questions please contact the national office of the *Society*, 838 5th Avenue, Des Moines 14, Iowa.

REGISTRATION FORM (Official File Copy)

Name_____
Last Please Print First

Male_____

Female_____

Address_____
Number and Street City

_____
State Chapter Affiliation

I plan to attend the SCSA Annual Meeting at Asilomar and to arrive at Monterey by AIR_____ RAIL_____ at_____ _____
Hour Date

I plan to travel by automobile_____.

I plan to stay at Asilomar Conference Grounds and prefer the following:

LONG HOUSE_____ HOTEL TYPE HOUSE_____

Double bed room for self and wife_____

Multiple rooms for self, wife and following children—

Name	Sex	Age

Will share a twin bed room_____ Preferred roommate_____

Single room_____

I plan to depart on_____ _____ _____ _____
Day Date Time Via

Special requirements or questions? Use this space

_____

_____

_____

It is important that this form be completely filled out and in the hands of the Registration Committee prior to July 1, 1957.

Richard Burleson, 4-H talent winner, provided entertainment.

Thaddeus H. Burak, chapter delegate to the national convention in Tulsa, reported and the group heard H. Wayne Pritchard, executive secretary, tell of the *Society* program for 1957.

A bronze plaque was presented to Matthew A. Puchalski for the most popular presentation at the meeting.

All Ohio

The first annual meeting of the All Ohio Chapter was held at the Youth Center, Ohio State Fairgrounds, Columbus, on January 21 and 22. More than 150 attended the two day meeting. A review of the program will indicate the calibre of the meeting. The first day included a symposium, *"Recent Technological Advances of Interest to Conservationists"* presided over by Frank Needham, Head, Farm Forestry Section, Department of Natural Resources, chairman.

1. *Advances in Knowledge of Interior Movement of Water in Ohio Soils*—George Taylor, Department of Agronomy, Ohio State University.
2. *Current Research in Soil Conservation at the Ohio Agricultural Experiment Station*—Garth Volk, head, Department of Agronomy, Ohio State University.
3. *Weather Phenomenon in Relation to Erosion*—L. T. Pierce, Ohio Climatologist, U. S. Weather Bureau.
4. *Advances in Techniques for Mapping*—F. J. Doyle, Professor, Institute of Geodesy, Photogrammetory, and Cartography, Ohio State University.
5. *A New Forestry Technique*—Burl Ashley, farm forester, Division of Forestry, Department of Natural Resources.
6. *Substituting Science for Emotion in Wildlife Management*—Charles Dambach, director, Natural Resources Institute, Ohio State University.

Following the symposium, Hayden Olds, Chief, Division of Wildlife, Department of Natural Resources, discussed, *"Conservation Possibilities in the Soil Bank."* Robert Jones, assistant state fair manager told the members of plans to improve the facilities.

At the banquet, A. J. Wright, Professor, Department of Geography, Ohio State University, gave insight into the: *"Impact of Industrial and Urban Expansion on Ohio Natural Resources."*

The second day John Slipher, Extension Conservationist, Ohio State University, presided over a symposium on *"Watershed Development."*

1. *Progress and Status of Ohio River Resource Inventory*—Robert Smith, assistant chief, Division of Water, Department of Natural Resources.
2. *Review of Small Watershed Program in Ohio*—T. C. Kennard, state conservationist, Soil Conservation Service.
3. *Helping Local Groups Organize Watershed Association*—Pearl Fogle, area conservationist, Soil Conservation Service.

H. Wayne Pritchard, executive secretary, represented the parent *Society*. John Ferguson, Department of Natural Resources, served as chairman of the program committee.

Hoosier

The Hoosier Chapter met in Indianapolis on January 11 to discuss the general subject of *Watershed Protection and Improvement*. The meeting proved successful and 28 new members joined to place Indiana over its membership goal for 1957.

The program conducted during the day was as follows:

What Are Some of the Problems Relating to Watersheds and What Has Been Done About Solving Them—C. E. Swain, state conservationist, Soil Conservation Service, Indianapolis.

Waters of Coveeta—U. S. Forest Service film—J. K. Vessey, assistant regional forester, Milwaukee, Wisconsin.

Philosophy and Intent of Public Law 566—Pete Ghormley, head, Engineering and Watershed Planning, Soil Conservation Service, Milwaukee, Wisconsin.

The Watershed as Related to the Indianapolis Water Supply—Daniel P. Morse, executive vice president, Indianapolis Water Company.

Watershed Legislation in Indiana—John Mellett, Indiana Economic Council.

Progress in Watershed Planning—Sheldon Boone, leader, Watershed Planning Party, Soil Conservation Service, Paoli, Indiana.

During the business session M. M. Merritt, Soil Conservation Service, Indianapolis, was elected chairman for 1957. Don McCune, Purdue University, was elected vice chairman while Ward Studor of Indianapolis was elected secretary-treasurer.

Salina (Kansas) Chapter met in Great Bend on March 22, with 50 members and guests present to hear C. E. Crews tell of his trip to Europe last summer.

Southern Illinois Chapter members met in Mt. Vernon March 13. William Casey, Game Biologist, State Department of Conservation, reported on development of wildlife habitat in the Shawnee National Forest.

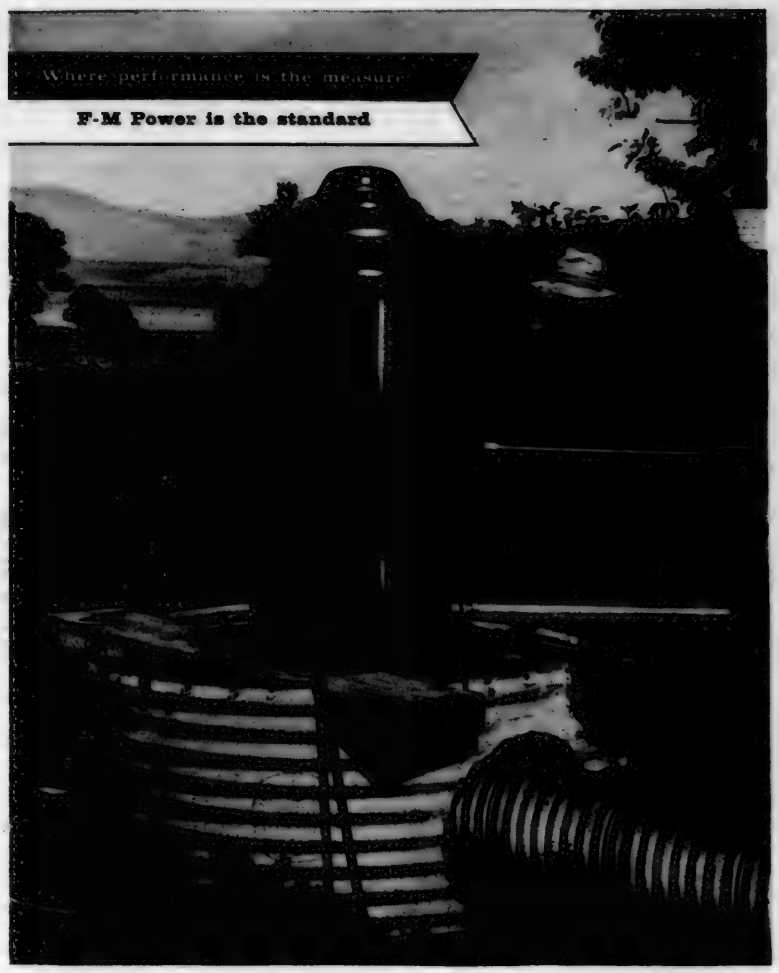
Stillwater (Oklahoma) Chapter met on March 21 with N. E. Winters as speaker. Winters, formerly Regional Director, Soil Conservation Service, is now retired and living in Stillwater. Student entertainment from Oklahoma A. & M. College was on the program.

Intermountain (Utah) Chapter new officers include Lowell J. Farmer, chairman; Clifford R. Collings, vice chairman; Leonard Conner, secretary-treasurer; T. B. Hutchings, director.

First annual meeting of the **Georgia** Chapter was held at Rock Eagle Park on May 3 and 4. An outstanding program was held with opportunity for swimming, fishing, boating, etc. Jackson Bennett, Athens, is chairman of Georgia chapter.

San Francisco Bay Chapter discussed "Pollution of Surface and Underground Waters" on April 1 with the program conducted by John B. Harrison, Executive Officer, San Francisco Regional Water Pollution Control Board. The chapter is busy with arrangements for the national convention on Monterrey Peninsula, August 28-31, 1957.

Inland Empire Chapter has awarded certificates, in conjunction with local soil



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conservation districts, to seven outstanding conservation farmers. The chapter has reached its 1957 membership goal established by the national committee. The chapter is making arrangements for visitors traveling through the state to the national convention in California to visit conservation points of interest.

Southwest Oklahoma Chapter was presented its charter by Harry Chambers, national council member, at a meeting in Hobart, Oklahoma, April 5, 1957. Thirty-seven were in attendance. Range Specialist Fred Whittington of Elk City was speaker.

Northern New England Chapter toured the Littleton Dam during the forenoon of April 12 and adjourned to the colorful St. Johnsbury House, St. Johnsbury, Vermont, for an afternoon program session. A panel discussion "Forest-Soil Site Studies and Their Values" with Seldon Lee Tinsley, Vermont Deputy State Conservationist, Soil Conservation Service, as moderator. Others on the panel included: Robert Farrington, Assistant State Forester, Vermont Forest Service. Frank Miller, Research Forester, University of Vermont; and Stephen Zayach, Soil Scientist, Soil Conservation Service. Professor George Dykhuizen, University of Vermont, presented a paper "Philosophy of the Conservation Movement". Richard Gowdy, Soil Scientist, Soil Conservation Service, was toastmaster at the banquet where a story telling contest was the feature. Members from Vermont, Maine, and New Hampshire were in attendance and re-elected Harold Pulling of Rutland, Vermont, as chapter chairman; Lewis Parlin, of Milford, Maine, as secretary. Ladies attending toured the Cary Maple Sugar Manufacturing Company.

High Plains (Kansas) B. W. Allred of the Farm and Ranch Planning Branch, Soil Conservation Service, Washington, D. C. was the speaker at the chapter meeting on April 8 in Colby, Kansas.

Northern Illinois Chapter executive committee holds regular meetings to plan chapter activities. Last such meeting was on February 15 in Champaign.

Manhattan Chapter heard C. E. Crews of Iola discuss "Touring Europe With an Eye on Conservation" at their meeting on March 9.

South Alabama Chapter has divided its territory into zones and each zone has planned a meeting during May and June. The entire chapter will gather for an annual meeting in December at Greenville. A. A. Sheppard, Dadeville, is chapter chairman.

"Show-Me" Chapter in Missouri has recently mailed two newsletters to their membership. One outlined possible programs for the year and named committee chairmen. The second contained a provocative article entitled "Mother Nature's Children" by Harold Grogger, chapter member.

Hoosier Chapter (Indiana) issues a monthly newsletter—colorful mimeographed sheet, edited in an interesting manner. The April issue reported a 13 percent gain in membership during the past month to bring their total to more than 100. John Hefner, Jr., Decatur, Indiana was reported to have signed 10 new members while several others had joined "Club 5".

The chapter has appointed eight correspondents over the state to keep the newsletter editor supplied with material.

Michigan Student Chapter

The Michigan Student Chapter, *Soil Conservation Society of America,* sponsored a series of lectures by the staff of the Ford Motor Company during March. The chapter is located at the University of Michigan, Ann Arbor.

Theme of the series of five meetings was *"Use and Conservation of Raw Materials in Our Economy."*

Thaddeus J. Obal, Senior Economic Analyst, Economic Analysis Department, Central Finance Staff, Ford Motor Company, led the first discussion on *"Economic Considerations of Conservation."*

Robert L. Bodor, Manager, Mining Properties Department, Manufacturing Staff, discussed, *"Industry's Needs and Search For Raw Materials."*

Stanley J. Gillen, Assistant General Manager, Steel Division, told of *"Problems in Automotive Industry's Use of Raw Materials—Especially Steel."*

Frank J. Kallin, Chief Civil Engineer, Plant Engineering Office, reported on, *"Disposal and Reclamation on Industrial Wastes."*

Donald Frey, Associate Director, Scientific Research Laboratory, Engineering Staff, discussed, *"The Search for Substitute and New Industrial Materials."*

Wisconsin Meeting Features Panel

Industrial leaders joined with conservationists to explore ways they could help each other at the annual meeting of the Wisconsin chapter on January 18. The meeting was held in facilities provided by the Allis-Chalmers Manufacturing Company in Milwaukee. More than 85 persons, representing various conservation organizations and industries, attended the luncheon and panel discussion.

Those appearing on the panel included W. J. Klein, vice president and director of sales of the tractor group, Allis-Chalmers Manufacturing Company; Robert Spitzer, vice president, Murphy Products; Lyman McKee, dairy farmer and president of the American Dairy Association of Wisconsin, and Arlie Mucks, director of livestock production with Oscar Mayer Company. Noble Clark, associate director of agricultural extension at the University of Wisconsin, summarized the panel discussion by saying it was evident that the industries associated with agriculture have been alert and have shown foresight in promoting the conservation of our natural resources.

Other features of the meeting included presentation of the Nash Conservation Awards by Cy Kabat, chapter chairman, to Les Woerpel, executive secretary of the Wisconsin Federation of Conservation Clubs, and to J. K. Vessey, U. S. Forest Service, Milwaukee. Vessey is also second vice president of the *Soil Conservation Society of America.* The awards are made by Nash of American Motors, but this year they asked local people to make the presentation and this was done at the chapter meeting.

The Wisconsin chapter also annually makes awards to Wisconsin people for outstanding contributions to the cause of conservation. This year awards were given to: Roy Ihlenfeldt of the State Department of Public Instruction; John Stauber, president of the Citizens National Bank of Marshfield, and to Charles Nygaard, a farmer from Chaseburg, Wisconsin, for his service on the State Soil Conservation Committee.

Cy Kabat of Madison and Ruth Hines of the same city were re-elected as chairman and secretary of the Wisconsin chapter.

Speakers on the panel of industrialists at the meeting of the Wisconsin chapter included, left to right: Robert Spitzer, vice president of Murphy Products, Burlington; Arlie Mucks, director of livestock production, Oscar Mayer Company, Madison; Lyman McKee, president, Wisconsin Dairy Association, Madison; W. J. Klein, vice president and director of sales of the tractor group, Allis-Chalmers Company, Milwaukee, and Noble Clark, associate director of agricultural extension, Madison.

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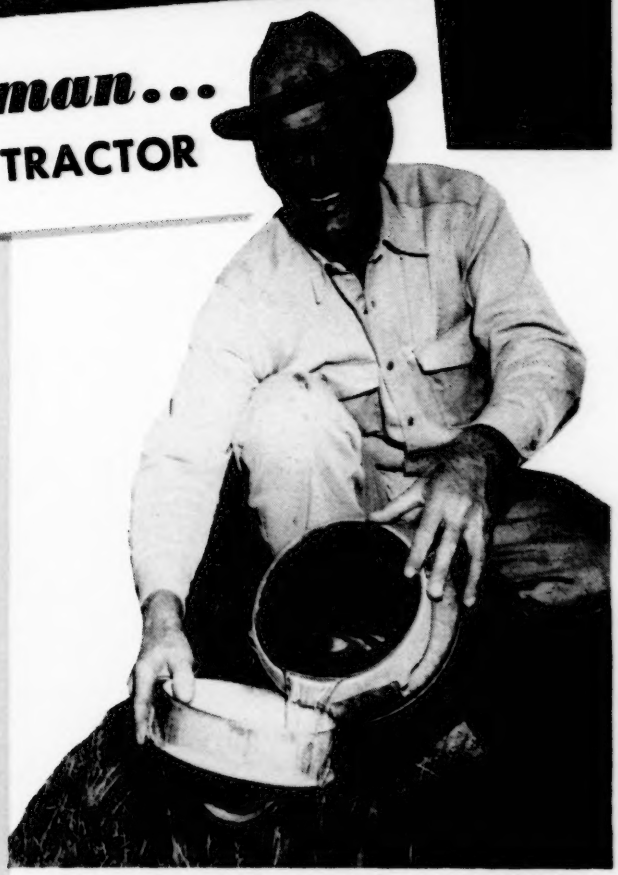

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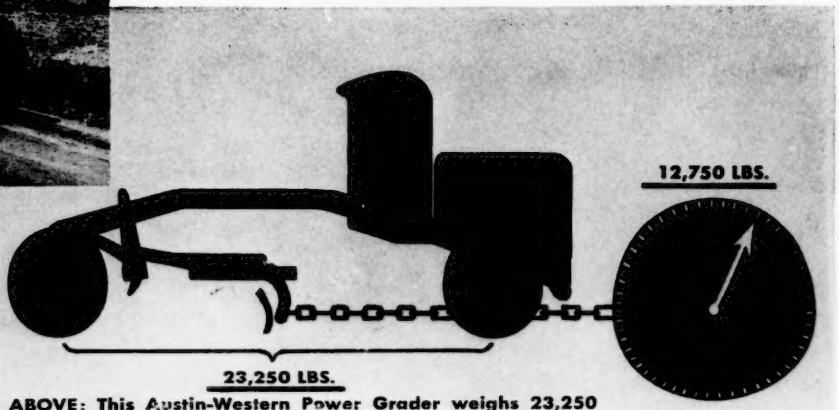

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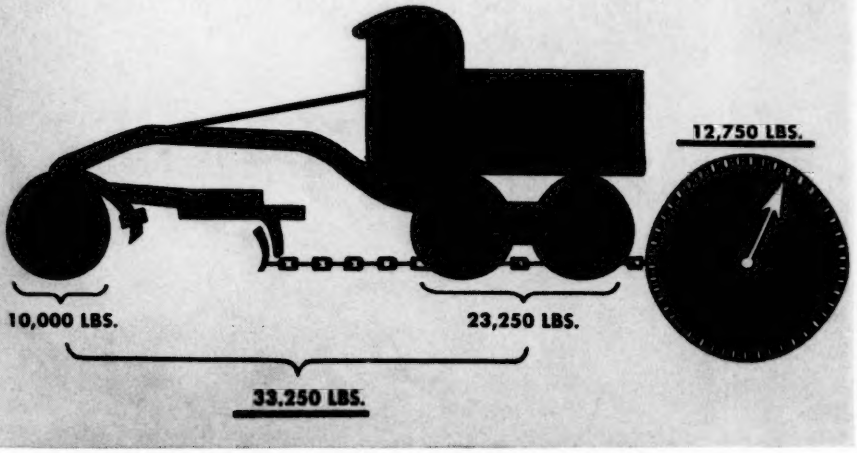

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